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U.S. Geological Survey

MINERALS YEARBOOK

Area Reports: International 2014

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Volume III

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U.S. Department of the Interior
U.S. Geological Survey

MINERALS YEARBOOK

Area Reports: International 2014

Asia and the Pacific

Volume III

U.S. DEPARTMENT OF THE INTERIOR
RYAN K. ZINKE, Secretary

U.S. GEOLOGICAL SURVEY
William H. Werkheiser, Deputy Director
exercising the authority of the Director

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industries during 2014 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

William H. Werkheiser, Deputy Director

Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the Internet at http://www.usgs.gov or by contacting the Earth Science Information Center at 1–888–ASK–USGS. For specific information about this publication, contact the Director, National Minerals Information Center, by mail at U.S. Geological Survey, 12201 Sunrise Valley Drive, 988 National Center, Reston, VA 20192, or by email at nmicrecordsmgt@usgs.gov, or by calling (703) 648–4961. Additional minerals information may be accessed at http://minerals.usgs.gov/minerals/.

Acknowledgments

The Country Specialists in the National Minerals Information Center, U.S. Geological Survey, in preparing the International Review regional books of volume III of the Minerals Yearbook, extensively use statistics and data on mineral production, consumption, and trade provided by various foreign Government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations are gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, United Nations publications, and the domestic and foreign technical and trade press. Of particular assistance were reports submitted by the Resource Reporting Officers and other officers of the Department of State in U.S. Embassies worldwide. Their contributions are sincerely appreciated. Internal statistical support was provided by the staff of the Data Collection and Coordination Section of the National Minerals Information Center. John H. DeYoung, Jr., Scientist Emeritus at the National Minerals Information Center, is acknowledged for his continued valuable contributions as a reviewer of these books.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

Steven M. Fortier
Director, National Minerals Information Center

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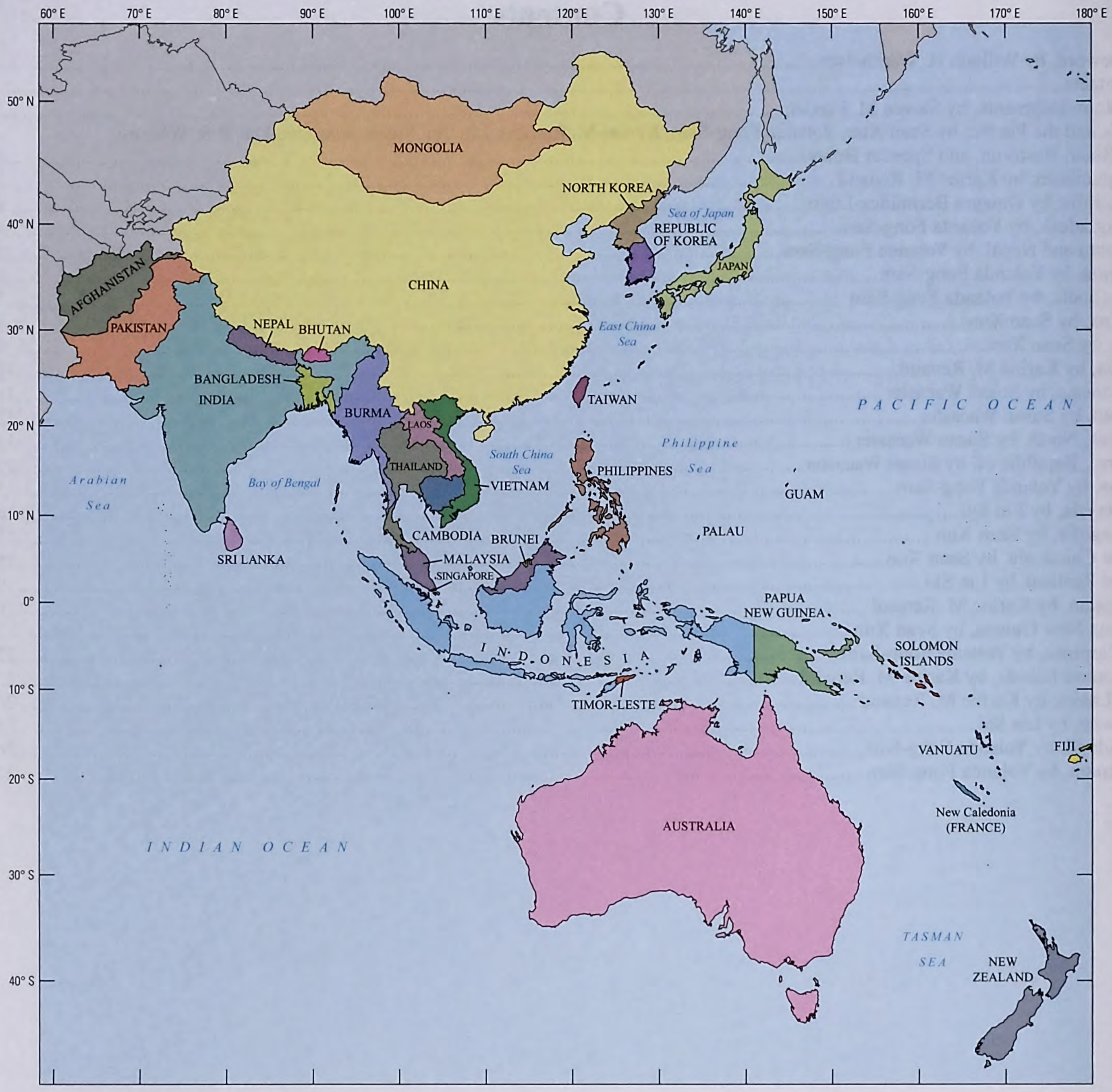

Base modified from ESRI ArcGIS online world countries (generalized) map data, 2017
Mercator Auxiliary Sphere projection
World Geodetic System 1984 datum

Figure 1. Map of the Asia and the Pacific region. The countries covered in this report are labeled on the map; bordering countries are shown in gray and not labeled.

THE MINERAL INDUSTRIES OF ASIA AND THE PACIFIC

By Sean Xun, Yolanda Fong-Sam, Karine M. Renaud, Lin Shi, Susan Wacaster, David R. Wilburn, Sinan Hastorun, and Spencer Buteyn

The Asia and the Pacific region as defined in this publication includes 30 countries and territories (fig. 1, facing page) and was the most populous region in the world in 2014. The land area of the Asia and the Pacific region accounts for about 20% of the world's total land mass, and the region's total population accounted for about 55% of the world total in 2014. The region's total gross domestic product (GDP) based on purchasing power parity was $42.6 trillion and accounted for about 39% of the world total. The region was relatively undeveloped, with an average GDP per capita that was about 29% lower than the world average. The economy of this region, however, had been growing at a pace that was twice the world's average during the past few years (tables 1, 2; Asian Development Bank, 2016, p. xxi).

The economic growth in the Asia and the Pacific region had been a major component of global minerals demand during the past 15 years. For example, China, which was the second largest economy in the world and one of the fastest growing economies in the region, imported 55 million metric tons (Mt) of iron ore in 1999, and this amount increased to 932 Mt in 2014. The region was not only the leading consumer of minerals in the global market, but also the leading producer of a variety of minerals. Production of some mineral commodities in the region, such as alumina, bauxite, cement, iron ore, refined copper, and steel, accounted for more than 50% of world production in 2014 (table 4; China Steel Yearbook Editorial Board, 2015, p. 256).

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For mineral production statistics—

- Australia—Australian Department of Industry and Science and Western Australia Department of Minerals and Petroleum Resources;
- Bhutan—Ministry of Trade and Industry, Department of Geology and Mines;
- Brunei—Prime Minister's Department, Petroleum Unit;
- Cambodia—Ministry of Industry, Mines and Energy, Department of Mineral Resources Development;
- India—Indian Bureau of Mines;
- Japan—Ministry of Economy, Trade and Industry, Research and Statistics Department;
- Laos—Ministry of Industry and Handicraft, Department of Geology and Mines;
- Malaysia—Ministry of Natural Resources and Environment, Minerals and Geoscience Department;
- Mongolia—Mineral Resources and Petroleum Authority;
- Nepal—Ministry of Industry, Commerce and Supplies, Department of Mines and Geology;
- Republic of Korea—Korea Institute of Geoscience and Mineral Resources;
- Sri Lanka—Geological Survey and Mines Bureau;
- Thailand—Ministry of Industry, Department of Primary Industries and Mines; and
- Vietnam—Vietnam Institute of Geosciences and Mineral Resources.

For key economic data—

- Asian Development Bank in Manila, Philippines;
- International Monetary Fund in Washington, DC; and
- The World Bank in Washington, DC.

For exploration and other mineral-related information—

- Australian Bureau of Statistics in Canberra, Australia; and
- SNL Metals and Mining (formerly SNL Metals Economics Group) in Charlottesville, Virginia.

General Economic Conditions

The real GDP rate of growth for the Asia and the Pacific region was 6.3% in 2014 compared with 6.8% in 2013. The GDP rate of growth for the world was 3.4% in 2014 compared with 3.3% in 2013. The economies of the region that recorded rates of growth higher than 7% in 2014 were Burma (8.7%), Papua New Guinea (8.5%), Mongolia (7.9%), Laos (7.4%), China (7.3%), India (7.2%), and Cambodia (7.1%) (table 2).

Economic growth in China since the late 20th century was the source of much of the unprecedented levels of demand for minerals and metals. Beginning in 2012, however, China's economic growth slowed from double-digit growth to about 7% to 8%, which was described as the "new normal" economic situation. The country's development was in transition from being investment-driven (infrastructure development associated with urbanization) and export-driven (export-oriented manufacturing) to consumer-driven (sustainable growth driven by domestic consumption). As a result, in recent years, the mining and mineral-processing industries in China experienced challenges, such as excess capacity and weak growth in demand owing to the slowdown that led to sustained oversupply and weak commodity prices on the regional and global markets (International Council on Mining and Metals, 2012, p. 3; PricewaterhouseCoopers LLP, 2015, p. 3, 9).

The economic slowdown in China had affected other economies in the region, including the member countries of the Association of Southeast Asian Nations (ASEAN) (whose leading trade partner was China) and Australia and Mongolia (whose leading mineral commodity export partner was China). India's economy, which benefited from low energy prices on the global market and increasing domestic demand, remained strong in 2014. The country was undergoing a series of reforms in such areas as the regulation of labor law and land acquisition to remove barriers to economic development. One of India's development strategies, the "Make in India" program, which sought to boost investment in manufacturing in India, could lead to significant increases in mineral production and consumption in the future.

Legislation

In 2014, the Asia and the Pacific region experienced two legislative events that had far-reaching economic effects on global mineral production and supply. One was the implementation of a new mining law in Indonesia that prohibited exports of unprocessed ores; the other was a ruling by the World Trade Organization (WTO) that declared that the rare-earth export quotas introduced by the Chinese Government in 2011 were in violation of WTO rules and commitments. These events are examples of nationalist resource policies that were adopted by the Governments of some countries in the region to increase revenue from downstream and higher value-added products, improve sustainable exploitation of strategic minerals, and attain or retain competitiveness in relevant economic sectors. Supply disruption of some mineral commodities as a result of implementation of these policies was observed in 2014.

Indonesia was a major producer and exporter of several mineral commodities in 2014, including bauxite, copper concentrate, and nickel ore. In 2013, Indonesia accounted for 22% of the world's nickel in ore (contained nickel) production and 20% of bauxite production; in 2014, following the export ban, Indonesia accounted for 3% of the world's nickel in ore (contained nickel) production and 1% of bauxite production. In response to the inaccessibility to mineral supplies from Indonesia in 2014, alternative sources of bauxite were developed in Malaysia, and nickel ore production increased dramatically in the Philippines in response to demand from China. In 2014, the region produced about 67% (171 Mt) of the world's total production of bauxite. Of this regional amount, Australia accounted for 46% (79 Mt); China, 38% (65 Mt); India, 12% (21 Mt); and Malaysia, 2% (3 Mt). Australia accounted for 31% of world bauxite production; China, 25%; and India, 8% (table 4; fig. 2, which follows the tables at the end of this chapter; Jensen and Burton, 2014; Sambijantoro, 2014; Winzenried and Adhitya, 2014; Rusmana, 2015; Bray, 2016; Kuck, 2016a, b).

China was the world's leading rare-earths producer, consumer, and exporter. In 2011, the Government imposed an export quota on rare earths, which caused significant supply disruption and price volatility on the world market. The export quotas were subsequently challenged by China's export partners (the European Union, Japan, and the United States) at the WTO. On March 26, 2014, a WTO panel issued a ruling saying that the rare-earth export quotas applied by China's Government were in violation of WTO rules and commitments. On April 17, China's Ministry of Commerce submitted a formal appeal to the WTO, and on August 7, the WTO made its final ruling that rejected China's claim. In compliance with the verdict, on December 31, China's Ministry of Commerce and General Administration of Customs announced the removal of the rare-earth export quotas, effective on January 1, 2015 (Chen, 2015; Chinese Society of Rare Earths, The, 2015).

In 2014, legislative actions continued in China to address the country's overcapacity of production, which had resulted in significant regional and global effects in recent years. In 2011, the Government issued the Notice on the Assessment and Implementation of the Program Aimed at Eliminating Outdated Production Capacity. According to the Ministry of Industry and Information Technology, in 2014 the program achieved its target and eliminated some annual capacities, including 230 million metric tons per year (Mt/yr) of coal, 28.23 Mt/yr of pig iron, 31.13 Mt/yr of steel, 18.53 Mt/yr of coke, 2.62 Mt/yr of ferroalloys, 1.94 Mt/yr of calcium carbide, 510,000 metric tons per year (t/yr) of electrolytic aluminum, 760,000 t/yr of smelted copper, 360,000 t/yr of smelted lead, 87.73 Mt/yr of cement, and 114,000 t/yr of rare-earth separation. The program, which was expected to continue in the near term, has had far-reaching effects on the regional and global raw materials industry (Ministry of Industry and Information Technology, 2011, 2014a, 2015).

In June, the ministers responsible for mining from the Asia-Pacific Economic Cooperation (APEC) member countries held a meeting in Beijing. APEC has 21 member countries, including Australia, China, Indonesia, Japan, Mexico, and the United States. A joint statement issued after the meeting identified the group's goal as sustainable development in the mining sector through closer cooperation within the Asia and the Pacific region, innovation-driven growth, social responsibility, and collaborative development. The Mining Task Force, which derives its mandate from priorities set by APEC leaders and ministers, was instructed to formulate and implement an action plan for the proposals agreed upon by the member countries. According to APEC, the member countries accounted for 75% of the world's mining trade and investment and about 70% of the world's mineral output and consumption, including most of the world's bauxite, copper, iron, nickel, silver, tin, and zinc (Asia-Pacific Economic Cooperation, 2016).

In October, representatives from 22 Asian countries signed a memorandum of understanding to establish the Asian Infrastructure Investment Bank (AIIB), which is a multilateral development bank headquartered in Beijing. The bank was to focus on the development of infrastructure in Asia and was expected to become a cooperation platform that could benefit China's raw material industry by providing accessibility to overseas markets for its overcapacity (Asian Infrastructure Investment Bank, 2016).

Exploration

The 2014 exploration budget for the Pacific region and Southeast Asia (excluding Australia) was about $600 million, which was down by 38% from the 2013 level of $960 million. Indonesia, Papua New Guinea, and the Philippines together accounted for about 82% of the total mineral exploration budget for the region. Much of the sustained interest in this region can be attributed to the continued interest by Chinese and South Korean companies to expand supply sources of gold, base metals, and rare-earth elements and by Japanese companies to develop regional copper and nickel deposits to supply Japan's smelting industry. Based on the data of active exploration sites compiled by the USGS, the three countries included in this region with the largest number of exploration sites were Indonesia, the Philippines, and Papua New Guinea, which together accounted for 67% of the active exploration sites in the region in 2014. Base and precious metals accounted for about 90% of all exploration activity in the Pacific region, with minor exploration activity for iron ore and other minerals (minor metals not classified as base or precious metals, and selected industrial minerals) in 2014. About 47% of the sites in this region were conducting early-stage exploration, 23% were exploring for minerals adjacent to producing mines, 20% were undergoing feasibility studies, and 10% were in development. Although nickel and bauxite exports from Indonesia had been curtailed, interest in exploration for nickel and bauxite increased in 2014 from countries in the region. Some selected exploration sites are listed in table 3 (Kean, 2014; SNL Metals & Mining, 2014).

In 2014, China's investment in mineral exploration was $18.6 billion, which represents a year-on-year decrease of 5.4%. The Australian Bureau of Statistics reported that Australia's mineral exploration expenditures (including coal and excluding petroleum) for fiscal year 2014 (from July 1, 2013, through June 30, 2014) were about $2.2 billion, which was a decrease of about 21% from the expenditures for fiscal year 2013 of $2.6 billion (SNL Metals & Mining, 2014; Australian Bureau of Statistics, 2015; Ministry of Land and Resources, 2015, p. 3–5).

Based on the number of exploration sites compiled by the USGS, exploration activity in Asia in 2014 was focused primarily on base metals (50% of all sites), precious metals (38%), iron ore (9%), and other minerals (3%). Selected exploration sites are listed in table 3 (SNL Metals & Mining, 2014).

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Commodity Overview

The estimates for the production of major mineral commodities for 2016 and beyond have been based upon supply-side assumptions, such as announced plans for increased production, new capacity construction, and bankable feasibility studies. The outlook tables (tables 5 through 20) in this summary chapter show historic and projected production trends; therefore, no indication is made about whether the data are estimated or reported, and revisions are not identified. Data on individual mineral commodities in tables in the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current producing facilities and on planned new facilities that operating companies, consortia, or Governments have projected to come online within the indicated timeframes.

Forward-looking information, which includes estimates of future production, exploration and mine development, the cost of capital projects, and timing of the start of operations, is subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes. Projects listed in the following sections are presented as an indication of industry plans and are not a USGS prediction of what will take place.

Metals

The Asia and the Pacific region was a significant producer of metal ore and metals; the production of some major metal commodities accounted for more than one-half of the world's total. Specifically, the leading commodities produced in the region in 2014 were—in order of the region's share of the world's total—mercury, which accounted for 97% of the world's total; tin (metal, primary), 89%; tungsten (W content of mine output), 89%; lead (refined, primary), 78%; pig iron, 75%; tin (Sn content of mine output), 73%; alumina, 69%; iron ore (gross weight), 69%; bauxite, 67%; steel (crude), 65%; zinc (metal), 64%; lead (Pb content of mine output), 63%; nickel (Ni content of mine output), 58%; aluminum (metal), 56%; copper (refined, primary), 53%; zinc (Zn content of mine output), 52%; nickel (metal, refined), 45%; manganese (Mn content of mine output), 41%; gold (Au content of mine output), 29%; and copper (Cu content of mine output), 18% (table 4).

The output of most commodities increased in 2014 compared with that of 2013. A noticeable increase was reported for iron ore production in Australia—to 746 Mt in 2014 from 609 Mt in 2013; the increase was a result of significant investment in capacity expansion in recent years. The output of mercury in China, which was the sole mercury-producing country in the region, increased to 2,200 metric tons (t) in 2014 from 1,600 t in 2013. The region's output of nickel (Ni content of mine output) decreased to 1.1 Mt in 2014 owing mainly to the decrease (to 55,284 t in 2014 from 225,000 t in 2013) in mine output in Indonesia after the implementation of the export ban on unprocessed minerals. The region's output of nickel metal (refined), however, increased to 575,000 t in 2014 owing mainly to the production increase in China (to 350,000 t in 2014). The region produced about 73% (190,000 t) of the world's total production of tin in 2014. Of the regional total, China accounted for 52%; Indonesia, 20%, and Burma, 18%. China accounted for 38% of world tin production; Indonesia, 15%, and Burma, 13%.The output of tin in Burma increased to 35,000 t in 2014 from 9,000 t in 2013; the increase was a result of increased demand from the Chinese electronics industry after Indonesia implemented a ban on tin exports in July 2013 (tables 4, 13, 16; fig. 2; Scrap Register, 2014).

Industrial Minerals

The region produced 3.17 billion metric tons of cement in 2014, which accounted for 74% of the world's total. Of this regional amount, China accounted for 79%, and India, 9%. China accounted for 58% of world cement pruduction, and India, 7% The region's percentage of world cement production compared with its share of the world's total GDP (39%) is a reflection of the large-scale infrastructure development taking place in the region. In 2014, the region produced 934,000 t of graphite, which accounted for 87% of the world total. Of this regional amount, China accounted for 80%, and India, 18%. China accounted for 70% of world graphite production, and India, 16%. In China, crystalline graphite was used in steel metallurgy and refractory materials; however, in recent years, the graphite had been deemed a strategic resource for aerospace, electronics, military, and nuclear power applications. The Government of China had issued a series of policies that identified graphene as one of the strategic materials. Other major industrial mineral commodities produced in the region in 2014 included, in order of the region's share of the world total, fluorspar (which accounted for 70% of the world total), magnesite (69%), and salt (35%). The changes in production tonnages for these industrial minerals were less than 7% in 2014 compared with those of 2013 (table 4; fig. 2; Ministry of Industry and Information Technology, 2014b; Liu, 2015).

Mineral Fuels

The Asia and the Pacific region's production of anthracite coal and bituminous coal accounted for about 82% and 69%, respectively, of the world's total in 2014. The region's shares of natural gas and crude petroleum production, however, were relatively low, accounting for 10% and 12%, respectively, of world production. The output of anthracite coal decreased by 21% in 2014 from that of 2013; the output of bituminous coal increased by 10%, followed by natural gas (5.5%), and crude petroleum (1.3%) (table 4).

Outlook

The production of most mineral commodities in the Asia and the Pacific region is projected to increase during the next few years owing largely to significant investments in capacity expansions in the region in response to the growth in demand from China. Lithium production is expected to increase by 71% by 2020 owing to several anticipated capacity additions in China to meet growth in demand from the battery industry. Nickel mine output is expected to increase as Indonesia recovers from the effects of the export ban on raw minerals. Iron ore production is expected to increase at a moderate rate because the production increases in Australia and India are expected to offset the anticipated decrease in China. Production of coal may decrease slightly as the output from such countries as Australia, India, and Indonesia would be insufficient to make up for the decrease in China, which was the leading coal producer in the region. The production of such other mineral commodities as bauxite, cobalt, copper, and rare-earth elements is expected to increase at modest rates or to remain at current levels (tables 5–20).

Global GDP growth, as projected by the International Monetary Fund (IMF), was expected to remain modest in 2016 (3.2%) and 2017 (3.5%), and to increase by less than 4% by the end of 2021. The average rate of growth for developing countries in the Asia and the Pacific region was projected to be 5.7% for both 2016 and 2017, which was lower than the 6.4% and 6.3% rates of growth in 2014 and 2013, respectively. These projections reflect anticipated economic challenges, such as weakness in the economies of oil-exporting countries, a moderate slowdown and a shift from manufacturing and investment to consumption in China, and a weak outlook for exporters of commodities other than oil. As a result, less-competitive, high-cost producers may be forced out of business and new capacity production may be postponed or canceled in response to challenging market conditions (tables 5–20; Asian Development Bank, 2016, p. xxi; International Monetary Fund, 2016, p. 17–18).

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TABLE 1
ASIA AND THE PACIFIC: AREA AND POPULATION IN 2014

Country	Area[1] (square kilometers)	Estimated population[2] (thousands)
Afghanistan	652,230	31,628
Australia	7,741,220	23,470
Bangladesh	148,460	159,078
Bhutan	38,394	765
Brunei	5,765	417
Burma	676,578	53,437
Cambodia	181,035	15,328
China	9,596,960	1,364,270
Fiji	18,274	886
India	3,287,263	1,295,292
Indonesia	1,904,569	254,455
Japan	377,915	127,132
Korea, North	120,538	25,027
Korea, Republic of	99,720	50,424
Laos	236,800	6,689
Malaysia	329,847	29,902
Mongolia	1,564,116	2,910
Nepal	147,181	28,175
New Caledonia	18,575	266
New Zealand	267,710	4,510
Pakistan	796,095	185,044
Papua New Guinea	462,840	7,464
Philippines	300,000	99,139
Singapore	697	5,470
Solomon Islands	28,896	572
Sri Lanka	65,610	20,771
Taiwan	35,980	23,434[3]
Thailand	513,120	67,726
Timor-Leste	14,874	1,212
Vietnam	331,210	90,729
Total	29,962,472	3,975,622
World total	148,940,000	7,259,692

[1] Source: U.S. Central Intelligence Agency, The World Factbook, 2016.

[2] Source: The World Bank, 2016 World Development Indicators Database.

[3] Source: Statistical Bureau of the Republic of China (Taiwan).

TABLE 2
ASIA AND THE PACIFIC: GROSS DOMESTIC PRODUCT IN 2014[1,2]

	Gross domestic product based on purchasing power parity		Real gross domestic product growth rate (percent)		
Country	Gross value (million dollars)	Per capita (dollars)	2012	2013	2014
Afghanistan	60,808	1,944	14.0%	3.9%	1.3%
Australia	1,099,538	46,562	3.5%	2.0%	2.6%
Bangladesh	536,482	3,391	6.3%	6.0%	6.3%
Bhutan	5,871	7,663	6.4%	4.9%	6.4%
Brunei	32,958	80,015	0.9%	-2.1%	-2.3%
Burma	262,278	5,101	7.3%	8.4%	8.7%
Cambodia	50,193	3,278	7.3%	7.4%	7.1%
China	17,960,665	13,131	7.7%	7.7%	7.3%
Fiji	7,640	8,628	1.4%	4.7%	5.3%
India	7,347,154	5,758	5.6%	6.6%	7.2%
Indonesia	2,685,315	10,649	6.0%	5.6%	5.0%
Japan	4,759,639	37,442	1.7%	1.4%	0.0%
Korea, North[3]	15,454	622	1.3%	0.8%	1.0%
Korea, Republic of	1,783,950	35,379	2.3%	2.9%	3.3%
Laos	34,531	5,006	7.9%	8.0%	7.4%
Malaysia	769,448	25,147	5.5%	4.7%	6.0%
Mongolia	34,909	11,933	12.3%	11.6%	7.9%
Nepal	67,137	2,388	4.8%	4.1%	5.4%
New Caledonia	9,712 [3]	37,862 [3]	2.9% [4]	2.2% [4]	2.8% [4]
New Zealand	161,047	35,359	2.8%	1.7%	3.0%
Pakistan	884,231	4,817	3.8%	3.7%	4.0%
Papua New Guinea	18,595	2,470	8.1%	5.5%	8.5%
Philippines	693,420	6,924	6.7%	7.1%	6.1%
Singapore	457,997	83,733	3.7%	4.7%	3.3%
Solomon Islands	1,099	1,911	4.7%	3.0%	2.0%
Sri Lanka	209,932	10,014	9.1%	3.4%	4.5%
Taiwan	1,080,074	46,091	2.1%	2.2%	3.9%
Thailand	1,067,029	15,542	7.2%	2.7%	0.8%
Timor-Leste	6,541	5,711	6.4%	2.8%	5.5%
Vietnam	512,582	5,650	5.2%	5.4%	6.0%
Regional total	42,616,229	XX	XX	XX	XX
Regional average	XX	10,719 [5]	6.6% [6]	6.8% [6]	6.3% [6]
World total	109,142,513	15,034 [5]	3.5%	3.3%	3.4%

XX Not applicable.

[1] Source: International Monetary Fund, World Economic Outlook Database, April 2016.

[2] Gross domestic product listed may differ from that reported in individual country chapters owing to differences in source or date of reporting.

[3] Source: United Nations Data 2013 and U.S. Central Intelligence Agency, The World Factbook, 2016.

[4] Source: U.S. Central Intelligence Agency, The World Factbook.

[5] Gross domestic product/population. Calculated using country data reported by the International Monetary Fund and the World Bank.

[6] Annual change in regional gross domestic product.

TABLE 3
ASIA AND THE PACIFIC: SELECTED SIGNIFICANT EXPLORATION SITES IN 2014[1]

Country	Type[2]	Site	Commodity	Company	Resources[3]
Australia	F	Castle Hill (Kunanalling)	Au	Phoenix Gold Ltd.	709,000 oz Au (R).
Do.	P	DeGrussa	Cu, Au	Sandfire Resources NL	376,000 t Cu, 456,000 oz Au (R).
Do.	P	Duketon area	Au	Regis Resources Ltd.	2.5 Moz Au (R).
Do.	P	Jundee	Au	Northern Star Resources Ltd.	415,000 oz Au (R).
Do.	P	Paulsens	Au	do.	124,000 oz Au (R).
Do.	P	Peak	Au, Ag, Cu	New Gold Inc.	412,000 oz Au, 820,000 oz Ag, 44,000 t Cu (R).
Do.	E	Pilbara iron ore	Iron ore	Flinders Mines Ltd.	500 Mt of iron ore (D).
Do.	P	Tropicana	Au	Anglogold Ashanti Ltd.	3.6 Moz Au (R).
Do.	E	West Musgrave	Ni, Cu, Co	Cassini Resources Ltd.	218,000 t Ni, 187,000 t Cu, 7,300 t Co (IF).
Do.	F	Wiluna	U	Toro Energy Ltd.	24,900 t U_3O_8 (D).
Do.	F	Yamarna belt	Au	Gold Road Resources Ltd.	2.5 Moz Au (D).
Cambodia	E	Kou Sa	Cu	Geopacific Resources Ltd.	Data not released.
Do.	E	Okvau	Au	Renaissance Minerals Ltd.	794,000 oz Au (ID).
China	P	White Mountain	Au	Eldorado Gold Corp.	571,000 oz Au (R).
Do.	P	Ying	Ag, Pb, Zn, Au	Silvercorp Metals Inc.	83 Moz Ag, 380,000 t Pb, 127,000 t Zn, 29,000 oz Au (R).
Indonesia	P	Martabe	Au, Ag	G-Resources Group Ltd.	2.7 Moz Au, 27 Moz Ag (R).
Mongolia	E	Kharmagtai	Cu, Au	Xanadu Mines Ltd.	245,000 t Cu, 939,000 oz Au (D).
Papua New Guinea	F	Wafi-Golpu	Au, Ag, Cu	Harmony Gold Mining Co. Ltd.	5.4 Mt Cu, 12.4 Moz Au, 19.8 Moz Ag (R).
Do.	E	Misima	Au, Ag	WCB Resources Ltd.	1.6 Moz Au, 8.6 Moz Ag (IF).
Philippines	P	Co-O	Au	Medusa Mining Ltd.	450,000 oz Au (R).
Do.	E	Masbate	Au	B2Gold Corp.	3 Moz Au (R).

Do. do. Ditto.

[1] Abbreviations used for commodities in this table include the following: Ag, silver; Au, gold; Co, cobalt; Cu, copper; Pb, lead; Ni, nickel; U_3O_8, uranium oxide; Zn, zinc. Abbreviations used for units of measure include the following: Moz, million troy ounces; Mt, million metric tons; oz, troy ounces; t, metric tons.

[2] E, active exploration; F, feasibility work ongoing/completed; P, exploration associated with producing site.

[3] Expressed as contained metal or element in ore based on 2014 data reported from various sources; D, demonstrated (measured + indicated); ID, indicated; IF, inferred; R, proven + probable. Resource data have not been verified by the U.S. Geological Survey. In cases where resource data have not been released, the site was considered noteworthy based on the level of exploration activity or regional significance.

TABLE 4
ASIA AND THE PACIFIC: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2014[1]

(Thousand metric tons unless otherwise specified)

	Metals										
	Aluminum			Copper			Iron and steel			Lead	
							Iron				
Country	Alumina	Bauxite	Metal[2]	Mine output, Cu content	Refined, primary	Gold, mine output, Au content (kilograms)	Iron ore, gross weight	Pig iron and direct-reduced iron	Steel, crude	Mine output, Pb content (metric tons)	Refined, primary (metric tons)
Afghanistan	--	--	--	--	--	50	--	--	9	--	--
Australia	20,475	78,633	1,704	969	507	274,000	746,000 [e]	3,300 [e]	4,412	728,000	176,000
Bangladesh	--	--	--	--	--	--	--	--	--	--	--
Bhutan	--	--	--	--	--	--	19	--	--	--	--
Brunei	--	--	--	--	--	--	--	--	--	--	--
Burma	--	--	--	33	33	900 [e]	--	--	--	18,000	200
Cambodia	--	--	--	--	--	--	NA	--	--	--	--
China[e]	47,800	65,000	28,100	1,620	4,820	486,000	1,510,000	713,740 [3]	822,300 [3]	2,800,000	3,140,000
Fiji[e]	--	640	--	--	--	1,160	--	--	--	--	--
India	3,800	21,000	2,100	36 [e]	653	--	129,800	55,166	87,292	106,000	129,000
Indonesia	--	2,555	211	406	175 [e]	69,100	--	--	3,000	--	--
Japan	--	--	189	--	1,109	7,115	--	83,872	110,666	--	97,303
Korea, North[e]	--	--	--	14	12	2,000	6,000	250	1,200	53,100	3,000
Korea, Republic of	--	--	--	--	620	284	693	46,909	71,036	2,764	280,000
Laos	--	--	--	71	89	5,265	1,149	--	--	--	--
Malaysia	--	3,258	--	--	--	4,038	9,615	--	4,316	--	--
Mongolia	--	--	--	249	2	11,504	6,389	--	64	--	--
Nepal	--	--	--	--	--	--	--	--	--	--	--
New Caledonia	--	--	--	--	--	--	--	--	--	--	--
New Zealand	--	--	328	--	--	11,989	--	670 [e]	900 [e]	--	--
Pakistan	--	31	--	13	--	--	255	142	900 [e]	--	--
Papua New Guinea	--	--	--	76	--	52,858	--	--	--	--	--
Philippines	--	--	--	92	130	18,423	827	--	1,196	--	--
Singapore	--	--	--	--	--	--	--	--	--	--	--
Solomon Islands	--	--	--	--	--	1,403	--	--	--	--	--
Sri Lanka	--	--	--	--	--	--	--	--	--	--	--
Taiwan	--	--	--	--	--	--	--	14,400 [e]	22,511	--	--
Thailand	--	--	--	--	--	4,576	348	--	3,500 [e]	--	--
Vietnam[e]	(4)	150	--	16	--	NA	4,355 [3]	650 [3]	2,900	6,000	--
Total	72,000	171,000	32,600	3,600	8,150	951,000	2,420,000	919,000	1,140,000	3,710,000	3,830,000
Share of world total	69.2%	66.0%	56.2%	18.0%	54.3%	29.1%	69.3%	74.7%	65.1%	62.6%	78.0%
United States	4,390	NA	1,710	1,360	1,050	210,000	56,700	29,400	88,200	379,000	--
Share of world total	4.2%	NA	2.9%	6.8%	7.0%	6.4%	1.6%	2.4%	5.0%	6.4%	--
World total	104,000	259,000	58,000	20,000	15,000	3,270,000	3,490,000	1,230,000	1,750,000	5,930,000	4,910,000

See footnotes at end of table.

TABLE 4—Continued
ASIA AND THE PACIFIC: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2014[1]

(Thousand metric tons unless otherwise specified)

	Metals								
	Manganese mine output, Mn content	Mercury, mine output, Hg content (metric tons)	Nickel, Ni content		Tin		Tungsten, mine output, W content (metric tons)	Zinc	
Country			Mine output	Refined metal	Mine output, Sn content (metric tons)	Metal, primary (metric tons)		Mine output, Zn content (metric tons)	Metal[2] (metric tons)
Afghanistan	--	--	--	--	--	--	--	--	--
Australia	3,000 [e]	--	244	114	7,207	--	477	1,560,000	482,000
Bangladesh	--	--	--	--	--	--	--	--	--
Bhutan	--	--	--	--	--	--	--	--	--
Brunei	--	--	--	--	--	--	--	--	--
Burma[e]	97 [3]	--	21 [p, 3]	--	35,000	30	143 [3]	6,100	--
Cambodia	--	--	--	--	--	--	--	--	--
China[e]	3,200	2,200	98	350	99,000	187,000	71,000	4,930,000	5,780,000
Fiji	--	--	--	--	--	--	--	--	--
India	945	--	--	--	--		--	706,000	723,000
Indonesia	38 [e]	--	55	--	38,545	58,233	--	--	--
Japan	--	--	--	56	--	1,746	--	--	583,021
Korea, North[e]	--	--	--	--	--	--	70	36,000	32,000
Korea, Republic of	--	--	--	NA	--	--	--	1,919	900,943
Laos	--	--	--	--	866	--	--	--	--
Malaysia	NA	--	--	--	3,777	35,018	--	--	--
Mongolia	--	--	--	--	--	--	--	46,600	--
Nepal	--	--	--	--	--	--	--	--	--
New Caledonia	--	--	178	55	--	--	--	--	--
New Zealand	--	--	--	--	--	--	--	--	--
Pakistan	--	--	--	--	--	--	--	--	--
Papua New Guinea	--	--	21	--	--	--	--	--	--
Philippines	3	--	523	--	--	--	--	--	--
Singapore	--	--	--	--	--	--	--	--	--
Solomon Islands	--	--	--	--	--	--	--	--	--
Sri Lanka	--	--	--	--	--	--	--	--	--
Taiwan	--	--	--	--	--	--	--	--	--
Thailand	7	--	--	--	156	16,929	100	39,140	65,694
Vietnam[e]	(4)	--	--	--	5,400	4,000	--	20,000	18,000
Total	7,290	2,200	1,410	575	190,000	303,000	71,800	7,350,000	8,580,000
Share of world total	41.0%	96.5%	71.3%	45.3%	72.7%	88.6%	89.0%	51.8%	63.6%
United States	--	--	--	--	--	--	NA	832,000	180,000
Share of world total	--	--	--	--	--	--	NA	5.9%	1.3%
World total	17,800	2,280	1,980	1,270	260,000	342,000	80,700	14,200,000	13,500,000

See footnotes at end of table.

TABLE 4—Continued
ASIA AND THE PACIFIC: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2014[1]

(Thousand metric tons unless otherwise specified)

	Industrial minerals					Mineral fuels and related materials			
						Coal			
Country	Cement, hydraulic	Fluorspar (metric tons)	Graphite (metric tons)	Magnesite	Salt	Anthracite	Bituminous	Natural gas, dry (million cubic meters)	Petroleum, crude (thousand 42-gallon barrels)
Afghanistan	102	20,000	--	--	35	--	233	140 [e]	67
Australia	9,000 [e]	--	--	450 [e]	13,000	--	442,000	64,897	128,960
Bangladesh	3,570	--	--	--	1,461	--	943	23,232	2,528
Bhutan	600 [e]	--	--	--	--	--	122	--	--
Brunei	NA	--	--	--	--	--	--	NA	NA
Burma	1,317	--	--	--	188	--	--	18,503	5,851
Cambodia	1,000 [e]	--	--	--	NA	--	--	--	--
China[e]	2,492,000 [3]	3,900,000	750,000	16,000	70,497 [3]	530,000	3,000,000	115,000	1,530,000
Fiji	190 [e]	--	--	--	--	--	--	--	--
India[e]	280,000	5,000	170,000 [3]	195 [3]	17,000	--	540,000	33,000	322,000
Indonesia	65,000 [e]	--	--	--	NA	NA	435,000 [4]	75,000	289,100
Japan	53,847	--	--	--	1,000 [e]	--	1,200 [e]	2,882	4,051
Korea, North[e]	6,600	--	10,000	--	NA	41,000	--	--	--
Korea, Republic of	63,247	--	--	--	304	NA	--	--	--
Laos[e]	1,500	--	--	--	9	110	--	--	--
Malaysia	21,700	--	--	--	--	--	2,688	62,000	210,000
Mongolia	411	375,000	--	--	2	--	24,415	--	7,405
Nepal	3,000 [e]	--	--	--	--	--	1	--	--
New Caledonia	106	--	--	--	--	--	--	--	--
New Zealand	1,200 [e]	--	--	--	100 [e]	--	3,992	5,440	13,804
Pakistan	31,960	8,938	--	4	2,541	--	3,085	40,000 [e]	34,232
Papua New Guinea	--	--	--	--	--	--	--	160 [e]	11,000
Philippines[e]	22,000	--	--	--	1,016 [3]	--	NA	4,000	2,500
Singapore	--	--	--	--	--	--	--	--	--
Solomon Islands	--	--	--	--	--	--	--	--	--
Sri Lanka	1,885	--	4,000 [e]	--	102	--	--	--	--
Taiwan	14,592	--	--	--	--	--	--	387	57
Thailand	34,980	NA	--	--	1,381	--	--	42,118	50,647
Vietnam	60,507	--	NA	--	766	41,697	--	10,210 [5]	123,000 [e]
Total	3,170,000	4,310,000	934,000	16,600	109,000	613,000	4,450,000	497,000	2,740,000
Share of world total	74.2%	69.5%	87.3%	68.6%	34.5%	81.7%	69.0%	10.4%	8.4%
United States	77,400	--	--	W	45,300	2,400	1,010,000	888,000	3,160,000
Share of world total	1.8%	--	--	W	14.3%	0.3%	15.7%	18.6%	9.7%
World total	4,270,000	6,200,000	1,070,000	24,200	316,000	750,000	6,450,000	4,770,000	32,600,000

See footnotes at end of table.

TABLE 4—Continued

ASIA AND THE PACIFIC: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2014[1]

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[e] Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. NA Not available. [p] Preliminary. W Withheld to avoid disclosing company proprietary data; not included in "World total." -- Zero or zero percent.

[1] Totals may not add due to independent rounding. Percentages are calculated on unrounded data. Table includes data available as of September 22, 2016.

[2] Primary and secondary production.

[3] Reported figure.

[4] Contains small amounts of anthracite.

[5] Natural gas, gross production.

TABLE 5
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 2005–2020[1]

(Thousand metric tons, gross weight)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	59,960	68,414	81,119	78,633	80,000	82,000	104,000
China	22,000	44,000	50,400	65,000	65,000	67,500	70,000
India	12,385	14,124	20,420	21,000	24,000	28,000	31,000
Indonesia	1,442	27,410	57,024	2,555	5,000	15,000	25,000
Malaysia	5	124	209	3,258	3,000	10,000	10,000
Other	33	90	270	671	450	500	500
Total	95,800	154,000	209,000	171,000	177,000	203,000	240,000

[e]Estimated.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 6
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PRIMARY AND SECONDARY ALUMINUM METAL PRODUCTION, 2005–2020[1]

(Thousand metric tons)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	2,030	2,060	1,778	1,704	1,700	1,700	1,700
China	9,740	20,200	25,100	28,100	33,000	35,500	38,500
India	942	1,607	1,700	2,100	2,600	3,000	3,500
Indonesia	252	253	255	211	200	250	270
Japan	240	180	172	189	190	200	200
New Zealand	373	343	325	328	330	330	330
Other	--	--	290	--	--	--	--
Total	13,600	24,600	29,600	32,600	38,000	41,000	44,500

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 7
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED COBALT MINE PRODUCTION, 2005–2020[1]

(Co content in metric tons)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	5,600	3,850	6,400	5,978	6,000	6,000	6,000
China	2,100	6,380	7,200	7,700	8,500	9,000	9,500
Indonesia	1,600	1,600	4,700	329	500	1,000	1,500
New Caledonia	--	2,850	3,190	4,400	5,000	5,500	6,000
Papua New Guinea	--	--	1,013	2,134	2,500	2,800	3,000
Philippines	300	2,100	2,126	4,094	5,000	5,000	5,000
Total	9,600	16,800	24,600	24,600	27,500	29,300	31,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 8

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 2005–2020[1]

(Cu content in thousand metric tons)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	930	870	1,001	969	1,000	1,000	900
China	762	1,160	1,540	1,620	1,620	1,720	1,820
Indonesia	1,064	878	504	406	600	700	800
Mongolia	127	125	187	249	260	270	280
Papua New Guinea	193	160	106	76	110	120	130
Philippines	16	58	91	92	93	95	95
Other	73	50	60	184	200	200	200
Total	3,170	3,300	3,490	3,600	3,880	4,110	4,200

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 9

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED REFINED COPPER METAL PRODUCTION, 2005–2020[1]

(Thousand metric tons)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	461	417	480	507	480	480	480
China	2,600	4,650	6,180	6,820	7,950	8,500	8,500
India	497	654	680	653	700	800	900
Indonesia	263	279	214	175	300	350	400
Japan	1,395	1,549	1,468	1,554	1,500	1,500	1,500
Korea, Republic of	519	565	586	620	600	600	600
Other	270	266	280	171	300	300	300
Total	6,010	8,380	9,890	10,500	11,800	12,500	12,700

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 10

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 2005–2020[1]

(Au content in kilograms)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	263,000	261,000	268,000	274,000	290,000	300,000	280,000
China	225,000	345,000	428,000	486,000	530,000	570,000	600,000
Indonesia	130,620	119,726	59,804	69,100	80,000	90,000	100,000
Japan	8,318	8,544	7,411	7,115	7,000	6,500	6,000
Laos	6,232	5,061	6,838	5,265	6,000	6,000	6,000
Mongolia	24,120	6,000	8,904	11,504	125,000	130,000	130,000
New Zealand	10,583	13,494	12,468	11,989	12,000	12,000	12,000
Papua New Guinea	68,483	58,983	56,035	52,858	53,000	55,000	58,000
Philippines	37,490	40,847	17,248	18,423	20,000	22,000	22,000
Other	19,000	19,800	23,000	14,411	15,000	17,500	20,000
Total	793,000	878,000	888,000	951,000	1,140,000	1,210,000	1,200,000

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 11

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED BENEFICIATED IRON ORE PRODUCTION, 2005–2020[1]

(Fe content in thousand metric tons)

Country	Average iron content	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	62%	163,000	271,000	367,000	448,000	490,000	550,000	590,000
China[e]	30%	134,000	350,000	435,000	453,000	402,000	378,000	355,000
India	64%	97,500	131,677	84,382	80,476	85,000	90,000	100,000
Other	64%	3,000	5,000	11,000	19,000	15,000	15,000	15,000
Total	XX	398,000	760,000	897,000	1,000,000	992,000	1,030,000	1,060,000

[e]Estimated. XX Not applicable.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 12

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED CRUDE STEEL PRODUCTION, 2005–2020[1]

(Thousand metric tons)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	7,790	7,408	4,646	4,412	4,900	4,600	4,300
China	353,240	637,230	779,040	822,300	783,000	750,000	730,000
India	45,800	68,976	81,299	87,292	93,000	100,000	200,000
Japan	112,470	109,599	110,595	110,666	110,000	112,000	120,000
Korea, Republic of	47,820	58,914	66,061	71,036	70,000	70,000	70,000
Malaysia	5,296	5,693	4,693	4,316	4,300	4,300	4,300
Taiwan	18,567	18,975	21,466	22,511	23,000	23,000	23,000
Other	13,000	15,000	15,000	8,793	10,000	10,000	10,000
Total	604,000	922,000	1,080,000	1,130,000	1,100,000	1,070,000	1,160,000

[e]Estimated.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 13

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED NICKEL MINE PRODUCTION, 2005–2020[1]

(Ni content in metric tons)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	189,000	170,000	234,000	244,000	230,000	250,000	270,000
Burma	10	--	9,000	21,000	22,000	24,000	25,000
China	72,700	80,000	93,300	98,400	105,000	110,000	115,000
Indonesia	135,000	235,800	225,000	55,284	150,000	200,000	300,000
New Caledonia	111,939	129,800	163,866	178,000	200,000	220,000	250,000
Papua New Guinea	--	--	11,369	21,000	25,000	28,000	30,000
Philippines	26,636	150,000	464,000	523,000	550,000	550,000	550,000
Total	535,000	76,600	1,201,000	1,140,000	1,280,000	1,380,000	1,540,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 14

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PALLADIUM MINE PRODUCTION, 2005–2020[1]

(Pd content in kilograms)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	550	650	610	600	600	600	600
China	450	850	900	900	1,100	1,500	1,700
Total	1,000	1,500	1,510	1,500	1,700	2,100	2,300

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 15

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PLATINUM MINE PRODUCTION, 2005–2020[1]

(Pt content in kilograms)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	111	130	176	180	150	150	150
China	700	1,500	1,600	1,600	1,900	2,700	3,000
Total	811	1,630	1,780	1,780	2,050	2,850	3,200

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 16

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED TIN MINE PRODUCTION, 2005–2020[1]

(Sn content in metric tons)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	2,819	18,263	6,472	7,207	7,000	7,000	7,000
Burma	708	800	9,000	35,000	35,000	35,000	35,000
China	126,000	93,200	97,000	99,000	110,000	110,000	100,000
Indonesia	78,404	97,796	45,800	38,545	40,000	42,000	40,000
Malaysia	2,857	2,668	3,697	3,777	3,800	3,800	3,800
Vietnam	5,400	5,400	5,400	5,400	5,400	5,400	5,400
Other	1,000	1,200	1,000	1,000	1,000	1,000	1,000
Total	217,000	219,000	168,000	190,000	202,000	204,000	190,000

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 17

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED TIN METAL PRODUCTION, 2005–2020[1]

(Metric tons)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
China	122,000	149,000	159,000	187,000	170,000	175,000	185,000
Indonesia	65,300	40,000	60,000	58,233	60,000	60,000	60,000
Japan	950	1,300	1,200	1,746	1,200	1,300	1,200
Malaysia	36,924	38,771	32,633	35,018	35,000	35,000	35,000
Thailand	31,600	20,000	19,088	16,929	17,000	17,000	17,000
Other	2,800	3,500	4,400	4,030	4,200	4,500	4,500
Total	260,000	253,000	276,000	303,000	287,000	293,000	303,000

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 18

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED DIAMOND PRODUCTION, 2005–2020[1]

(Thousand carats)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	34,307	10,000	11,482	9,288	16,000	18,000	20,000
China	100	150	200	200	200	200	200
India	58	50	73	75	50	50	50
Indonesia	30	37	37	37	35	35	35
Total	34,500	10,200	11,800	9,600	16,300	18,300	20,000

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 19

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED LITHIUM PRODUCTION, 2005–2020[1]

(Li content in metric tons)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	4,800	8,200	12,400	13,300	13,700	19,300	22,500
China	3,600	6,000	10,500	11,000	13,000	16,000	19,000
Total	8,400	14,200	22,900	24,300	26,700	35,300	41,500

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 20

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 2005–2020[1]

(Thousand metric tons)

Country	2005	2010	2013	2014	2016[e]	2018[e]	2020[e]
Australia	370,000	427,000	478,000	503,000	530,000	540,000	560,000
China	2,260,000	3,240,000	3,970,000	3,880,000	3,650,000	3,500,000	3,350,000
India	360,000	507,000	590,000	567,000	598,000	780,000	925,000
Indonesia	192,920	224,677	377,847	435,000	400,000	500,000	500,000
Korea, North	23,500	41,000	42,000	41,000	40,000	40,000	40,000
Mongolia	8,256	25,246	29,164	24,415	22,000	21,000	20,500
New Zealand	5,267	5,330	4,625	3,992	4,000	4,000	4,000
Pakistan	3,367	3,429	2,985	3,085	3,200	7,000	7,300
Philippines	3,165	6,650	10,732	12,406	13,000	13,000	13,000
Thailand	21,429	18,399	18,111	17,991	18,000	18,000	18,000
Vietnam	34,093	44,835	41,064	41,697	42,000	42,000	42,000
Other	5,390	7,000	8,200	8,000	7,800	8,000	8,000
Total	3,290,000	4,600,000	5,600,000	5,540,000	5,330,000	5,470,000	5,490,000

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

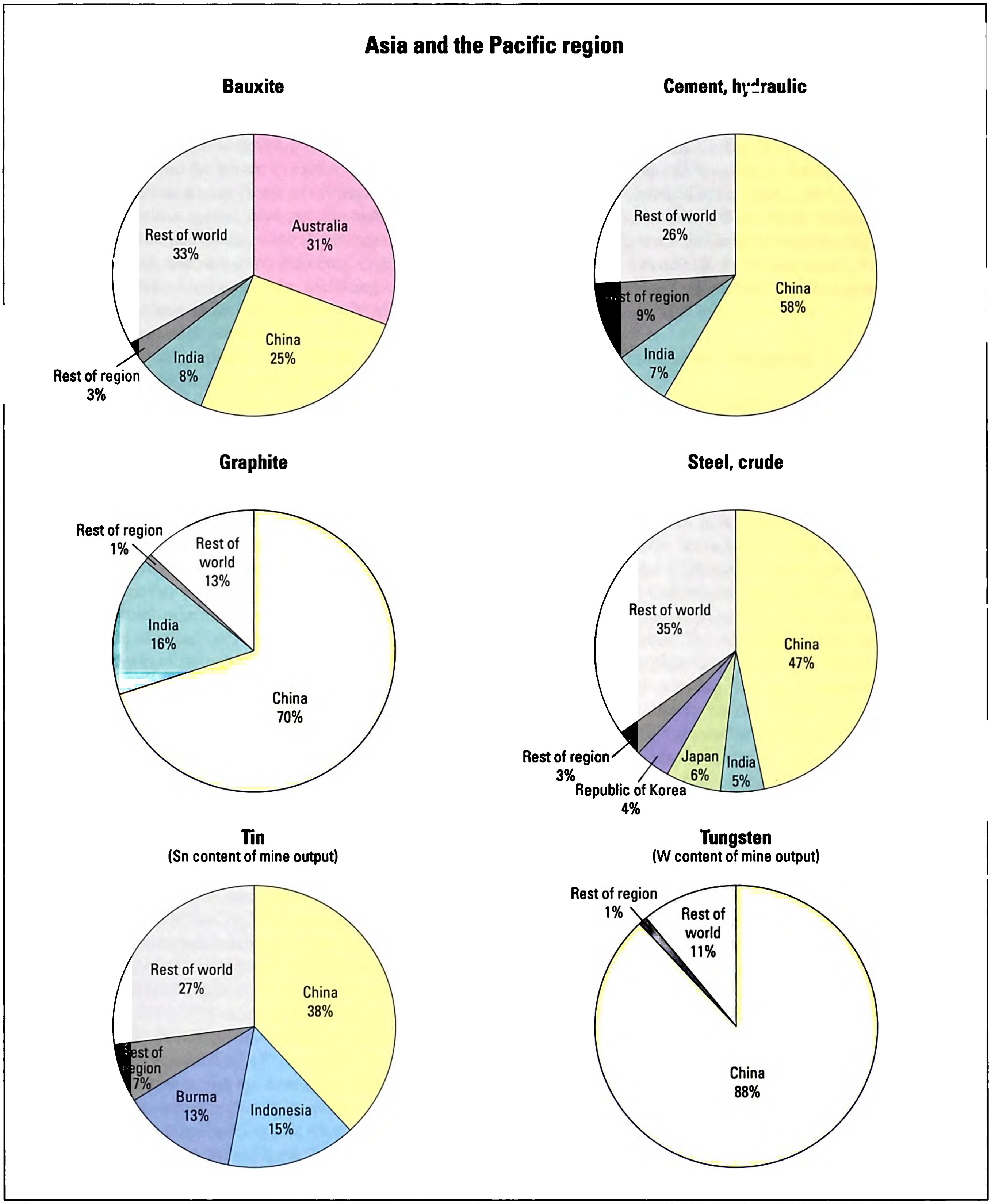

Figure 2. Pie charts showing percentage of world production of selected mineral commodities by countries of the Asia and the Pacific region in 2014. Individual countries of the region are labeled if they accounted for at least 3% of world production. Data are from table 4. Percentages may differ from those reported in individual country chapters owing to differences in source or date of reporting.

THE MINERAL INDUSTRY OF AFGHANISTAN

By Karine M. Renaud

Afghanistan has the potential to develop its mineral extraction sector far beyond the sector's current limited scope of activity. The country has a wide range of mineral resources, including base and precious metals, construction materials, industrial minerals, crude petroleum, natural gas, precious and semiprecious stones, and rare-earth elements. Owing to security issues and a lack of infrastructure, including electricity, mining and mineral processing facilities, and roads, most of these resources remained undeveloped in 2014. Such mineral resources as chromite, coal, gypsum, lime, marble, natural gas, salt, and talc continued to be exploited through artisanal and small-scale mining. Development of the mineral sector could provide an engine for self-sustaining economic growth for the country in the near future; however, it would require considerable investment to develop infrastructure and to improve security (Afghanistan Geological Survey, 2014; Special Inspector General for Afghanistan Reconstruction, 2014b, p. 174; U.S. Geological Survey Project in Afghanistan, 2014a).

According to the Ministry of Mines and Petroleum (MOMP), mineral resources were being mined illegally and smuggled out of the country, which was affecting the country's economic growth. Also, the use of explosives by untrained miners adversely affected the environment as well as the quality of the mineral commodities produced (Global Witness Ltd., 2012, p. 9; Afghanistan.ru, 2013; Popal, 2014, p. 4, 6; Special Inspector General for Afghanistan Reconstruction, 2014a, p. 174).

Minerals in the National Economy

The real gross domestic product (GDP) increased by 1.7% in 2014 compared with an increase of 3.4% (revised) in 2013 owing to the prolonged gridlock and the political uncertainty of shared government power and concern about security; the nominal GDP was $20.84 billion in 2014. According to the Central Statistics Organization, mining revenue decreased by 16% to $22.3 million (AFN1.30 billion)[1] in 2014 compared with $27.6 million (AFN1.55 billion) in 2013, and accounted for 1% of the GDP in 2014. The value of industrial sector output accounted for 20.9% of the GDP in 2014. The value of the construction sector increased by 47.4% in 2014 from that of 2013; much of the increase was the result of construction in the city of Kabul (Central Statistics Organization, 2014a, p. 157–158, 171; Special Inspector General for Afghanistan Reconstruction, 2014a, p. 174, World Bank, The, 2014; Asian Development Bank, 2015, p. 167).

Afghanistan relied heavily on international assistance for basic expenses. Funds received from international donors for development in Afghanistan were estimated to total $4.0 billion in 2014 compared with $2.8 billion in 2013. The donor agencies and countries were the United States, which contributed $1.3 billion, Japan ($570 million), Germany ($346 million), the European Union ($261 million), the United Kingdom ($254 million), the World Bank ($205 million), Australia ($163 million), the Asia Development Bank ($114 million), Denmark and Sweden ($122 million each), Norway ($109 million), and Canada ($93 million) (Central Statistics Organization, 2015, p. 272).

Government Policies and Programs

The MOMP is the main entity responsible for mining policy and the oversight and regulation of the mining sector, including mineral exploration and exploitation. The Ministry of Finance is the agency responsible for taxation, revenue collection, negotiation of mining contracts, and regulation of extractive industries in Afghanistan. The MOMP has several subagencies, including the Afghanistan Geological Survey (AGS), the Afghanistan Petroleum Authority, and the Inter-Ministerial Committee. The AGS is responsible for providing information on geology and promoting interest in mineral resources. The Afghanistan Petroleum Authority consists of the Afghan Gas Enterprise, which is responsible for the production, processing, and transportation of natural gas, and the General Directorate of Oil and Gas Survey, which is responsible for the exploration and development of crude oil and natural gas. The Inter-Ministerial Committee's responsibilities include ensuring the broad oversight of mining activities and advising various Government institutions on the status of resource development, assessments, authorizations, exemptions, and royalty rates of "medium to large" mining contracts. The Mining Revenue Management Policy ensures that the revenue generated from mining is allocated to designated sectors. The MOMP Cadastre Directorate accepts and processes applications for mineral rights, coordinates their technical and environmental evaluation, processes renewals, and collects application and surface right fees. The Afghan National Environmental Protection Agency (NEPA) certifies mine operations according to the Environmental Law (Humayoon, 2013, p. 2, 10; Popal, 2014, p. 5, 6; Special Inspector General for Afghanistan Reconstruction, 2015, p. 3).

The Mining Law of Afghanistan is composed of the Minerals Law (2005) and the Mining Regulations (2009). In 2011, amendments to the Minerals Law of 2005 were drafted by the MOMP. In August 2014, the amendments were approved by the former President of Afghanistan, and were passed by the Parliament in the fourth quarter of 2014. The current Minerals Law states that all naturally occurring minerals are the property of the state, but it gives companies the right to bid for both exploration and exploitation licenses and to conduct mineral exploration and exploitation. The rights to extract mineral commodities from sand and gravel and construction material quarries are obtained on a first-come-first-served basis. According to the new law, if investors find economically viable deposits, there is no guarantee that they will be granted exploitation licenses for the deposits. The Minerals Law states that the MOMP should comply with the Extractive Industries Transparency Initiative (EITI) standards. The EITI is a global coalition of Government, public and private companies, and civil society working together to improve transparency and the responsible management of revenues from natural resources, such as oil, gas, and nonfuel minerals. In February 2010, Afghanistan was recognized as an EITI- compliant country after it met all the requirements in the EITI standard (Humayoon, 2013, p. 7; Popal, 2014, p. 5, 6; Special Inspector General for Afghanistan Reconstruction, 2014a, p. 175; Zaheer, 2014).

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[1] Where necessary, values have been converted from Afghan afghani (AFN) to U.S. dollars (US$) at an average rate of AFN58.24=US$1.00 for 2014 and AFN56.25=US$1.00 for 2013.

Fixed royalty rates were not included in the 2011 Minerals Law but were to be included in new mineral regulations. In 2013, almost all royalty rates on contracts issued by the MOMP were agreed to by the bidders. West Land General Trading L.L.C. (WLGT) of the United Arab Emirates (UAE), for example, agreed to pay a 26% royalty rate, and Afghan Krystal Natural Resources Co. agreed to pay a 20% royalty rate. The royalty rate for marble was between 10% and 30%, and the royalty rate for lapis lazuli was 15% (Humayoon, 2013, p. 9, 18, 23).

In 2012, the U.S. Agency for International Development (USAID) implemented a 4-year Assistance in Building Afghanistan by Developing Enterprises (ABADE) program. The objectives of the program are to work with the private sector in Afghanistan to increase the production and rate of employment at enterprises, to increase domestic and foreign investment in businesses, and to increase sales of products. Javed Waziri PVC and Aluminum Production Ltd., which is located in Pol-e-Charkhi Industrial Park, Sarak Naw in Kabul, was one of the companies included in the ABADE program (U.S. Agency for International Development, 2012; 2014a, p. 2–3).

Production

According to the Central Statistics Organization, the MOMP Cadastre Directorate, and the Afghan Gas Enterprise, Afghanistan's production of coal decreased by an estimated 75%; rock salt, by 72%; and nitrogen (N content of ammonia), by 21%. Production of marble increased by 103%; cement by 97%; chromium (chromite ore), by 93%; gold, by 70%; and gypsum, by an estimated 5% (table 1; Central Statistics Organization, 2014a, p. 163, 164, 166).

Structure of the Mineral Industry

Table 2 is a list of major mineral facilities operating in 2014.

Mineral Trade

Afghanistan's total value of trade in 2014 was $524 million compared with $424 million in 2013, of which exports totaled $515 million in 2014 compared with $415 million (revised) in 2013, and imports totaled $8.7 million in 2014 compared with $9.1 million in 2013. Afghanistan imported 33,056 metric tons (t) of fertilizer in 2014, of which 13,693 t was imported from Iran; 12,310 t, from Kazakhstan; 3,561 t, from Pakistan; 3,029 t, from Uzbekistan; 453 t, from China; and 10 t, from Tajikistan. The country also imported 669 million metric tons (Mt) of cement, of which 514 Mt was imported from Pakistan; 156 Mt, from Iran; 1,364 t, from China; and 66 t, from the UAE. In 2014, Afghanistan exported 100,000 t of coal to Pakistan. It also exported 9,687 t of marble, of which 4,707 t went to Pakistan; 2,618 t, to China; 1,739 t, to Iran; 453 t, to Hong Kong; and 170 t, to Italy (Central Statistics Organization, 2014a, b, d).

Afghanistan's exports to the United States were valued at $72.0 million in 2014 compared with $45.5 million in 2013. Of this amount, gemstones accounted for $1 million, and iron and steel accounted for about $12,000. In 2014, imports from the United States were valued at $792 million compared with about $1.4 billion in 2013; these included $1 million in iron and steel products, $368,000 in petroleum products, $117,000 in chemical fertilizers, $64,000 in aluminum and alumina, $32,000 in natural gas liquids, $21,000 in nonferrous metals, $17,000 in nonmetallic minerals, $15,000 in steelmaking materials, and $10,000 in copper (U.S. Census Bureau, 2014a, b).

Commodity Review

Metals

Chromium.—In 2014, production of chromite ore increased by 93% to 6,369 t from 3,309 t in 2013. Most of the chromite deposits occur in Logar, Paktia, and Parwan Provinces. In 2014, the Government signed five new chromite contracts with such companies as Hashimi Mining Co. for the Dadukhil and Dih Now of Puli Alam chromite areas in Logar Province; the Stana Baba Mining Company for the Baboos, Mughulkhil, and Sarkhnjak chromite areas in Logar Province; the Abdurahman Baba Metal Co. for the Lalander chromite area in Char Asiab District near Kabul; and the Afghan Active Mining Co. for a chromite occurrence in Kohi Safi District in Parwan Province. On May 18, 2010, a mining contract was signed between the MOMP and Hewad Brothers Mining Co. (HBMC) for a chromite deposit in the Gadakhil area of the Kohisafi District in Parwan Province. As a part of the terms of the contract, the company was expected to construct a road from the chromite deposit to the main road and to establish a plant for chromite processing within Afghanistan. The HBMC also agreed to pay a 26% royalty to the Government. As of 2014, there was no update on the status of the contract (table 1; Ministry of Mines and Petroleum, 2014c, d).

Copper.—In 2007, the Aynak copper project, which was one of the large-scale projects in Afghanistan, was awarded to Jiangxi Copper Co. Ltd. (JCL) of China. JCL was the minor shareholder in the joint venture between China Metallurgical Group Corp. of China Ltd. (MCC) and JCL. The consortium established MCC–JCL Aynak Minerals Co. Ltd. (MCC–JCL) to oversee contractual commitments related to the Aynak copper project. Copper production at the project was delayed as a result of insurgent attacks, the need to clear the area of Soviet land mines, and the presence of an archaeological site in the area of Mes Aynak. The Mes Aynak site contains a Buddhist monastery complex that includes temples and hundreds of sculptures, as well as a possible Bronze Age site beneath the Buddhist ruins. During a 3-year period (2010 to 2012), there was a rush to rescue and salvage the most important artifacts. In January 2013, the MOMP extended the conservation work indefinitely, stating that archaeological efforts could be conducted along with the development of the copper mine. In addition, there were problems with forcing villagers to move, underpayment of workers, and the potential for contamination of the groundwater owing to the improper disposal of chemical waste (Global Witness Ltd., 2012, p. 5; Kuo, C.S., 2013).

Another reason for delaying copper production was the lack of phosphate rock for the smelting operations. In April 2008, an agreement between the Government and the MCC–JCL stated that, in order for the MCC–JCL to proceed with funding, construction, and operation of a smelter for the Aynak project, the Government would need to provide access to limestone, phosphate, and quartz (silica) deposits. Phosphate is used to neutralize acid created during the smelting operation, and it forms a fertilizer byproduct. According to the 2008 agreement, the fertilizer produced by the Aynak copper project would be sold to the Government by MCC at cost. If access to a phosphate source was not available, the investors wanted to renegotiate the terms of the contract. As of the end of 2014, no mining was taking place at the Aynak site; however, archeological artifacts were being excavated and land mines were being cleared. In the fourth quarter of 2014, the site was closed owing to a presidential election and a strike by archeologists who had not been paid for 6 months. The Government and the MCC–JCL were continuing to renegotiate the contract in 2014, and the company had evacuated all technical personnel from the site owing to security concerns (Kuo, Kendrick, 2013; Ministry of Mines and Petroleum, 2013b, p. 15; Metallurgical Corp. of China Ltd., 2014, p. 19; Special Inspector General for Afghanistan Reconstruction, 2014b, p. 177).

In December 2011, the MOMP started a tender process for two copper-gold prospects. In 2014, all the contracts and bids were under review by the new National Unity Government of Afghanistan. The Shaida porphyry copper prospect in Herat Province, had an exploration area of 250 square kilometers (km^2) and historical estimated, inferred, and possible copper resources of 4.8 Mt at a grade of 1.0% copper. Afghan Gold and Minerals Co., which was owned by Afghan Krystal Natural Resources (51%) and Afghan Gold Holdings [Guernsey (United Kingdom)] (49%) was the winning bidder for exploration rights to the Balkhab copper prospect. The Balkhab copper prospect is a volcanogenic massive sulfide deposit with an exploration area of 210 km^2 in Sar-e Pol Province and 247 km^2 in Balkh Province; it has historical copper resources estimated to be about 100 Mt. The Balkhab deposit includes areas of extensive azurite, bornite, disseminated chalcopyrite, galena, malachite, and pyrite mineralization with copper grades of 0.25% to 1.34%. As of 2014, the contracts for two of the prospects remained unsigned. The contracts were awaiting Cabinet approval, and they were expected to be reviewed by the MOMP for compliance with the new mining law (Rigby, 2011, p. 13, 16, 18; Ministry of Mines and Petroleum, 2012a, b; 2013a; Special Inspector General for Afghanistan Reconstruction, 2014a, p. 175–176).

Gold.—In 2014, about 3,000 people from various districts came to Takhar Province to search for gold in the Takhar River; approximately 730 kilograms (kg) of gold was sold locally in Afghanistan. West Land General Trading LLC (WLGT) had obtained exploration and extraction licenses for the Nooraba and the Samti gold deposits in Takhar Province in 2008, and in March 2013, WLGT renewed the licenses for the Nooraba and the Samti gold deposits (Ministry of Mines and Petroleum, 2008, p. 4, 5; Pajhwok Afghan News, 2014a, b; Zarlatoon, 2014, p. 15, 26).

Afghan Krystal Natural Resources was awarded a 2-year exploration license with the right to obtain a 10-year mining license for the Qara Zaghan gold project in 2010. Afghan Krystal Natural Resources was backed by foreign investors from the United States, Indonesia, Turkey, and the United Kingdom through a deal facilitated by JPMorgan Chase & Co. of the United States. The company signed a contract in January 2011 to explore the Qara Zaghan gold mine, which is located near the village of Qara Zaghan in Baghlan Province, and planned to invest $50 million in developing the mine. Central Asian Mining Services conducted a ground magnetic survey, performed soil sampling, and drilled 2,000 meters (m) of core samples for analysis. In 2014, the feasibility report was submitted to MOMP. The feasibility studies showed that Qara Zaghan was not economically viable and the company decided to cancel its licenses (Ministry of Mines and Petroleum, 2011, p. 5; Alikuzai, 2013, p. 16; Central Asian Mining Services, 2014; Erek, 2014).

In December 2011, the MOMP started a tender process for two large copper-gold prospects. In December 2012, the joint venture of Sterling Mining Co. of Afghanistan and Belhasa International Corp. L.L.C. of the UAE was selected as the winning bidder for the Zarkashan copper-gold prospect in Ghazni Province. This prospect had two licensed exploration areas covering a total of 25,280 km^2 (combined) with historical estimated, inferred, or possible gold resources at a grade of 7.1 grams per metric ton (g/t) gold (containing 525 kg of gold) and "reconnaissance" resources at a grade of 6.9 g/t gold (containing about 2,200 kg of gold). The Sterling/Belhasa joint venture planned to award a subcontract to the related South African firms of DRA Mining (Pty) Ltd., DRA Mineral Projects (Pty) Ltd., and Minopex (Pty) Ltd. for technical work on the project, including exploration of the licensed area, development of the deposit, and mine management. The Turkish-Afghan Mining Co., which was a joint venture of Afghan Gold and Minerals Co. of Afghanistan (49%) and Eti Gümüş S.A. of Turkey (51%), was the winning bidder for the Badakhshan gold prospect. The Badakhshan gold prospect in Badakhshan Province is a quartz-vein deposit with four licensed exploration areas of 250 km^2 each. Of these four areas, the Veka Dur gold prospect has historical indicated or probable and inferred gold resources grading 4.1 g/t gold and containing 960 kg of gold. The Afghan Mineral Group was the winning bidder for the Shaida porphyry copper prospect (Peters and others, 2011, p. 168; Rigby, 2011, p. 13, 16, 18; Ministry of Mines and Petroleum, 2012a, b; 2013a; Special Inspector General for Afghanistan Reconstruction, 2014a, p. 175–176).

Iron and Steel.—Domestic iron scrap was used by most of the steel companies in Afghanistan to produce crude steel. In 2014, the production of crude steel was 9,009 t compared with 9,000 t in 2013. The production of cast iron was 24,000 t in 2014 compared with 24,580 t in 2013. The steel manufacturing companies in Afghanistan were Sino-Afghan Steel Co., which was operated by the Watan Group, and Maisam Steel Mill, which operated a steel plant in Pul-e-Charkhi Province, with a production capacity of 36,500 metric tons per year (t/yr). Maisam was a medium-sized company funded by the USAID's ABADE program; it used scrap to produce steel construction material and employed 200 workers (table 1; U.S. Agency for International Development, 2014a, b; Central Statistics Organization, 2014c, p. 163).

Haji-Gak, which is Afghanistan's largest iron ore deposit, is located in Bamyan Province and extends into Parwan and Maidan Wardak Provinces. In 2011, Kilo Goldmines Ltd. of Canada (25%) and an Indian consortium led by Steel Authority of India Ltd. (SAIL) (75%) were awarded a mining contract for the Haji-Gak deposit. The historic resources (measured, indicated, inferred, and reconnaissance) for the entire deposit were estimated by Soviet and Afghan geologists to be 1.7 billion metric tons at an average grade of 61.3% iron, and the reserves in the near-surface oxidized ore were estimated to be 85 Mt in the most thoroughly explored area. The Government was in the final stage of negotiations with the Indian consortium to develop three blocks of the Haji-Gak iron ore deposit. The consortium had originally proposed to invest $10.8 billion to develop the three blocks, which would include the development of three iron ore mines and the construction of a 6-million-metric-ton-per-year (Mt/yr)-capacity steel plant. Because of uncertainties regarding Afghanistan's mining laws, the consortium decreased the proposed capacity of the steel plant to 1.2 Mt/yr and reduced its proposed total investment to $1.5 billion. As of 2014, the negotiations continued for the Haji-Gak iron ore project, while companies were still waiting for approval of the mining law (Renaud and others, 2011, p. 451, 460; Sutphin and others, 2011, p. 570, 579; Das, A.K., 2014; Das, K.N., 2014; Special Inspector General for Afghanistan Reconstruction, 2014a, p. 163; p. 176).

Industrial Minerals

Cement.—Afghanistan's cement production was not competitive with imported cement owing to the use of older and less efficient production technologies. All cement plants were in need of modernization and equipment and facility upgrades, including ungraded power lines, as well as expanded employee training. Sometime after March 2013, the MOMP planned to privatize the Jabal-e Saraj cement factory in Parwan Province, the Ghori I and II cement plants within the Ghori cement complex in Baghlan Province, and the Herat cement plant in Herat Province. Jabal-e Saraj, which was a one-kiln operation, had the potential to produce up to 100 metric tons per day (t/d) or 36,000 t/yr of clinker; however, it had not produced cement for some years. The Ghori I cement plant had been in operation since the 1950s. It was a two-kiln operation with a design capacity to produce 400 t/d (or 144,000 t/yr) of clinker. The Ghori II plant was a two-kiln facility with a design capacity to produce 1,000 to 1,200 t/d (300,000 to 360,000 t/yr) of clinker. The production capacities of the Ghori I and Ghori II plants were limited by the availability of powdered coal to produce thermal energy. The MOMP estimated that the combined capacity of the two plants was about 10% to 50% of the design capacity owing to the lack of powdered coal needed to fuel the plants. Afghan Investment Co. had proposed building a 4,000-t/d-capacity Ghori III cement plant (which would be a greenfield plant) next to the Ghori I and the Ghori II plants. At the time of a visit by the U.S. Geological Survey (USGS) and the Task Force for Business and Stability Operations (TFBSO) in 2010, the Ghori III cement plant was still under consideration. In 2012, Peshgaman Sanat-i-Majad of Iran agreed to build a 1-Mt/yr-capacity plant in Herat Province. The contract reportedly was canceled. In 2014, the MOMP initiated the Cement Production Facilities Tender (CPFT), which included three tender projects—Jabal-e Saraj, Herat, and Ghori III, however, the Ghori III project was withdrawn. The objectives of the CPFT were to mine the raw material for cement plants, construct and operate new cement production facilities, supply power to the cement plants, and pay royalties. The winning bidder for the Jabal-e Saraj plant was Lego Afghan Logistic Service and the winning bidder for the Herat plant had not been determined by yearend (Mossotti, 2011, p. 1241, 1250–1251, 1253, 1261–1263; 2014, p. 20–22; Global Cement, 2013; CemNet.com, 2014a, b; Marx Group, The, 2014).

Fluorite.—Amania Mining Co. was established in 2010 and was involved in exploration, development, mining, and processing of the Bakhud fluorite deposit in Kandahar Province, which covered an area of 50,057 km^2. Amania Mining began exploring the Bakhud fluorite deposit, validating all Soviet data, updating geologic maps, and collecting data in 2013. The deposit was divided into four blocks—northern, southern, eastern, and western. Exploration of the deposits was completed in 2014; the reserves for all four blocks were estimated at 8.8 Mt averaging at 47% CaF_2 and 4.1 Mt of fluorite. The fluorite was extracted from an open pit mine. The pilot metallurgical processing plant was designed in August 2014, and fully commissioned with a minimum capacity of 36,000 t/yr to a maximum capacity of 60,000 t/yr by December. In 2014, Amania Mining. produced 20,000 t of fluorspar (Amania Mining Co., 2014, p. 2, 4, 7, 16, 26, 32, 43; 2015).

Gemstones.—Gemstone mining in Afghanistan started 6,500 years ago and continues. In 2014, precious and semiprecious stones were produced in Afghanistan. The precious stones produced included emeralds, rubies, and sapphires; a total of 11,198 grams of precious stones were produced in 2014. The semiprecious gemstones produced include aquamarine, garnet, kunzite, lapis lazuli, and tourmaline, and a total of 4,700 t of gemstones were produced. Gemstone mines are found in four locations—Panjshir Valley (emeralds), Jegdalek (rubies and blue sapphires), Badakhshan (lapis lazuli and garnet), and Nuristan (aquamarine, beryl, kunzite, spodumene, and tourmaline). The Jegdalek sapphire and ruby mine is located 35 kilometers (km) west of the Sarobi District and 100 km southeast of Kabul City; part of the mine was state-owned and part was occupied by locals. The largest garnet mine is located in the Eshkashim District in Badakhshan Province. Lapis lazuli was extracted from mines at Sar-e-Sang in the Kokcha Valley in northeastern Afghanistan. The Panjshir Valley emerald mines are located at elevations of 3,000 to 4,000 m in an area that is 16 km long and 3 km wide. Buzmal Mine was a small-scale mine in Panjshir Valley, which extends through the Kapisa and Parwan Provinces and northeast of the capital of Kabul. Emerald was produced at the Mukeni-Zara Kel and Ringe Mines in 2014 (table 1; Bowersox and others, 2000, p. 110, 113; British Geological Survey, 2014; Pajhwok Afghan News, 2014a, b).

Stone, Dimension.—Marble quarrying was developing quickly in Afghanistan. The Association of Marble and Granite Producers of Afghanistan (AMGPA) reported 130 marble quarries throughout Afghanistan, including in Badakhshan, Balkh, Faryab, Ghazni, Helmand, Kabul, Logar, Nangarhar, Parwan, Samangan, and Maidan Wardak Provinces; however, most of the quarries were inactive owing to high royalty rates. The Equity Capital Group (Equity Capital Mining Co.) was established in 2006 with a production capacity of 150,000 t/yr of marble. It was the leading marble producer in Afghanistan, and it owned the Chest-i-Sharif marble quarry, which was located 150 km east of Herat City. Most of the marble produced was exported to Pakistan, where it was cut into blocks and slabs, polished, and exported back to Afghanistan. In 2014, three new contracts for marble extraction were signed between the MOMP and such companies as Adil Drotheres Marble (for marble in Herat Province), Natural Stone Processing Co. (for marble in Maidan Wardak Province), and Ehsan Aziz Construction Co. (for onyx marble in Helmand Province) (AMS International Consulting, 2011; Ministry of Mines and Petroleum, 2014c; Mossotti, 2014, p. 44, 48).

Talc.—In June 2013, the production capacity of Amin Karimzai Ltd. and HZM Marmi e Pietre Private (Pvt) Ltd. of Pakistan signed a joint-venture agreement for the production and distribution of talc in Afghanistan and Pakistan. The production capacity of Amin Karimzai's Ghunday talc mine in the Kodi Khel area of Nangarhar Province was 400,000 t/yr of talc. HZM Marmi e Pietre had the capacity to produce 240,000 t/yr of talc in Afghanistan and Pakistan. The combined production capacity was 640,000 t/yr of talc (Hughes, 2013). As of 2014, there was no update on the project.

Mineral Fuels and Related Materials

Coal.—Nearly all the coal deposits in Afghanistan are deep and presently inaccessible. Most of the country's coal deposits were undeveloped owing to rugged terrain, a lack of roads and infrastructure, and a lack of security. The coal in Afghanistan is used to power cement and fertilizer plants, textile facilities, and food-processing plants. Most of the major coalfields are located in the north-central part of Afghanistan. Access to all coalfields was by road or trail only. North Coal Enterprise (NCE), which was a Government-owned company, produced coal (U.S. Geological Survey Project in Afghanistan, 2014b).

The Government planned to privatize Government-owned coal mines. In 2009, Mesq Sharq Ltd. was awarded the license for the Abkhorak coal mine in the northern part of Samangan Province. In 2013, the Abkhorak Mine collapsed and the local villagers shut down the mine, blaming Government engineers for poor mine construction and a lack of safety precautions. The Ahandara, the Dudkash, the Karkar, and the Khurdara coal mines were privatized by Afghan Coal LLC (ACC) in 2007. In 2013, ACC decided to rebuild and modernize the tunnels in the Ahandara, the Dudkash, and the Karkar coal mines; the date for the reconstruction and modernization of the mines was not specified. As of 2014, there was no update on plans for reconstruction and modernization of the coal mines (Afghan Cement LLC, 2013; Wadsam.com, 2013a; 2014).

Natural Gas and Petroleum.—Afghanistan was heavily dependent on imports of crude oil and natural gas from Iran, Pakistan, Russia, Turkmenistan, and Uzbekistan. The output of crude oil from the wells in the Amu-Darya Basin in northern Afghanistan (Faryab and Sar-e-Pol Provinces) was expected to increase to 40,000 barrels per day (bbl/d) in 2014 from 25,000 bbl/d in 2013. All crude oil would be exported initially through one of Afghanistan's northern neighboring countries. The cost of the project was estimated to be $600 million. In 2014, China National Petroleum Corp. and Watan Oil and Gas (CNPCI-W) halted drilling and exploration owing to budgeting disputes between the companies. In August and September 2014, the CNPCI–W produced 2,000 bbl/d (Hall, 2013; Thomson Reuters, 2014).

In April 2014, as part of the Afghan-Tajik Basin Phase II tender, the MOMP awarded a hydrocarbon exploration and production-sharing contract (EPSC) to Bakhtar Oil and Gas Co. LLC for the Ahmadabad-Balkh Block and the Mohammad Jan Dagar Block, which cover a combined area of 7,319 km^2 and are located in northern Afghanistan near the border with Turkmenistan and Mazar-e-Sharif City. In January 2014, the MOMP had announced a third oil and gas tender for exploration and development of the Totimaidan Block, which is located in western Jowzjan and eastern Faryab Provinces. The estimated reserves of the Block were 28 billion cubic meters (Ministry of Mines and Petroleum, 2014a, b).

In 2013, an oil refinery with the capacity to produce 1.28 million barrels per year (Mbbl/yr), which was owned and operated by a joint venture led by Kam International Oil, opened in Hairatan, which is located near the border with Uzbekistan. By yearend, the Kam refinery started an expansion project to increase the refinery's capacity to 197 Mbbl/yr. The expansion was expected to be completed in 2 to 3 years. Also in Hairatan, Afghanistan's second crude oil refinery, which had a capacity of 6,000 bbl/d, began operations. The plant was owned by the Ghazanfar Group. In 2014, more than 12,800 thousand barrels of oil obtained from the Amu Darya Basin were sent to Kam International for refining (Afghanistan Chamber of Commerce and Industries, 2013; Wadsam.com, 2013b; Ghazanfar Group, 2014; Pakistan Defence, 2014).

In 2013, a Memorandum of Understanding (MOU) was signed between the MOMP and the United States Government regarding Afghanistan's natural gas industry. According to the MOU, by June 2014, the U.S. Government would do the following: (a) restore the existing 89-km Sheberghan-Mazar gas pipeline, which would help to increase the production of the Northern Fertilizer powerplant in Mazar-e-Sharif; (b) build a new, 94-km pipeline between Sheberghan and Mazar; and (c) build a gas refinery plant in Yateemtaq. TFBSO intended to hire professionals to lead the operations and to train staff. An agreement regarding the Turkmenistan, Afghanistan, Pakistan, and India (TAPI) 1,680-km gas pipeline was signed by Afghanistan, India, Pakistan, and Turkmenistan. The pipeline was to become operational by 2018 and was to have the capacity to carry 90 million cubic meters per day of natural gas. Turkmenistan expected to sell 38 million cubic meters per day of natural gas to India and the same amount to Pakistan, and Afghanistan would receive the remaining 14 million cubic meters per day of natural gas. In 2014, the Asian Development Bank contracted with the Penspen Engineering Group of the United Kingdom to conduct a feasibility study for the TAPI natural gas pipeline. Penspen's feasibility study included the following: (1) a review of the proposed route, (2) a confirmation of the compressor station size and location, and (3) an estimate of the cost of project development and a schedule. The feasibility study was expected to take 6 months to complete (Hindu, The, 2012; Ministry of Mines and Petroleum, 2013a; Penspen, 2014; Press Trust of India, 2014; Special Inspector General for Afghanistan Reconstruction, 2014a, p. 181; U.S. Agency for International Development, 2015).

Outlook

The Government of Afghanistan has intensified its effort to develop mineral resources by implementing changes in the Mineral Law to improve and strengthen Government transparency and accountability and to provide reliable security at mine sites. The Government is also actively working to attract foreign investment for the country's mineral industry. Foreign investment in infrastructure and transportation for mining is expected to be a key factor in the development of the mineral industry. Licenses for mining chromite and marble and for extracting hydrocarbons have been awarded and continued to be awarded in 2014. Bidders were selected for several copper and gold prospects. The country is expected to offer more tenders for bids for energy resource development in the near future (United Nations Environment Programme, 2013, p. 40).

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TABLE 1

AFGHANISTAN: PRODUCTION OF MINERAL COMMODITIES [1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
METALS						
Gold, mine output	kilograms	NA	NA	NA	30	50 [e, 3]
Iron and steel, metal:						
Cast iron		--	--	--	24,580	24,000
Steel, crude		--	--	--	9,000	9,009
INDUSTRIAL MINERALS						
Aragonite		NA	NA	NA	NA	1,000
Cement, hydraulic		36,000	38,000	37,000	52,000 [r]	102,276
Chromite ore		6,000	6,000	6,000	3,309 [r]	6,369
Fluorspar		--	--	--	--	20,000
Gypsum		63,000	62,000	57,000	57,000	60,000 [e]
Lime		128,000	128,000	130,000	130,000	127,000
Marble		29,000	29,000	45,000	271,000 [r]	550,011
Nitrogen, N content of ammonia		27,000	27,000	50,000	76,000	60,000
Salt, rock		186,000	186,000	147,000	124,100 [r]	35,000
Talc[3]	kilograms	NA	NA	NA	NA	55
Tantalum	do.	NA	NA	NA	NA	7,283
Precious stones[3]	grams	NA	NA	NA	NA	11,198
Semiprecious stones	kilograms	NA	NA	NA	NA	4,745,055 [4]

See footnotes at end of table.

TABLE 1—Continued
AFGHANISTAN: PRODUCTION OF MINERAL COMMODITIES [1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous		725,000	750,000	780,000	936,000	233,000
Gas, natural:						
Gross	million cubic meters	142	142	161	155[r]	160
Marketed	do.	140	142	145	141	140[e]
Petroleum, condensate	42-gallon barrels	64,000	70,000	80,000	68,000	67,000

[e] Estimated data are rounded to no more than three significant digits. [r] Revised. do. Ditto. NA Not available. -- Zero.

[1] Table includes data available as of July 30, 2015.

[2] Aluminum, barite, and sand and gravel were produced by artisanal miners, but available information was not adequate to make reliable estimates of output.

[3] As reported by the Afghan Ministry of Mines and Petroleum Cadastre Directorate.

[4] Includes some partial-year data reported through September 9, 2014.

Sources: Central Statistics Office, Ministry of Mines and Petroleum Cadastre Directorate, and the Afghan Gas Enterprise.

TABLE 2
AFGHANISTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Aluminum, secondary:			
Extrusion and powder coating	Qader Najib Ltd.	Kabul	NA
Manufacture	Salam Bilal Ltd.	Kandahar Province	360
Do.	Javed Waziri PVC and Aluminium Production Ltd.	Pol-e-Charkhi, Kabul	NA
Do.	Khalil Najeeb Steel Mills Ltd.	Bagrami industrial area, Kabul	36,000
Cement	Afghan Cement L.L.C. (a subsidiary of Government-owned Afghan Investment Co.)	Ghori I, Pul-e-Khomri, Baghlan Province	144,000
Do.	do.	Ghori II, Pul-e-Khomri, Baghlan Province	360,000
Chromite	Hewad Brothers Mining Co.	Gadakhil Area, Kohisafi District, Parwan Province	250
Coal	NA	Ashpostah Mine, Bamyan Province	160,000
Do.	Meesaq Sharq Ltd.	Abkhorak Mine, Samangan Province	60,000
Do.	Khushak Brothers Co. and North Coal Enterprise	Dara-e-Suf, Roee Duab, and Tala Barfak Mines, Samangan and Badakhshan Provinces	1,214,000
Do.	Afghan Coal L.L.C. (a subsidiary of Government-owned Afghan Investment Co.)	Karkar and Dudkash Mines, Baghlan Province	164,000
Do.	Khushak Brothers Co.	Sabzak Mine, Herat Province	15,000
Copper, in concentrate	MCC-JCL Aynak Minerals Company Ltd. (China Metallurgical Group Corp., 75%, and Jiangxi Copper Company Ltd., 25%)	Aynak Mine,[1] Logar Province	180,000

See footnotes at end of table

TABLE 2—Continued
AFGHANISTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity^e
Fluorite		Amania Mining Co.	Bakhud fluorite mine in Kandahar Province	60,000
Gold	kilograms	West Land General Trading L.L.C.	Nooraba Mine, Takhar Province	4,740
Gypsum		Massoud Aryaie Trading Co.	Baghlan Province	2,000
Do.		Samar Naweed Co.	Balkh Province	2,000
Gemstones, lapiz lazuli		Ljewardeen Mining Co.	Sar-e-Sang, Badakhshan Province	NA
Natural gas	cubic meters	Afghan Gas Ltd. (Government-owned)	Jowzjan	70,000
Do.	do.	do.	Sheberghan	14,000
Oil and gas		Dragon Oil plc, 40%; Türkiye Petrolleri A.O., 40%; Ghazanfar Group, 20%	Sanduqli and Mazar-i-Sharif Blocks	NA
Petroleum, refined	42-gallon barrels	Kam International	Hairatan oil refinery, Hairatan Town, Balkh Province	186,000
Salt		NA	Daulatabad salt mine, Faryab Province	100,000
Do.		Westco International FZE	Kalfagan Mine, Kalfagan area, Takhar Province	500,000
Do.		do.	Taqchakhana Salt Mine, Namak Aab District, Takhar Province	100,000
Sand and gravel		Abdul Rahim (Son of Sad Uddin)	Herat Province	75,000
Do.		Sahar Pairaze Construction Co.	Kabul Province	25,000
Do.		Meyad Mskan Construction Co.	do.	25,000
Do.		Najeebullha Son of Haji Meer Mohammad	Baghlan Province	10,000
Steel, crude		Afghan Folad Steel Mill Corp. Ltd.	Herat Province	29,000
Do.		NA	Maisam steel mill, Pul-e-Charkhi, Kabul	36,500
Do.		Sino-Afghan Steel Co. (owned by Watan Group)	Kabul	NA
Stone, dimension, marble		Equity Capital Group	Herat Province	150,000
Do.		Mohammad Aziz (son of Mohammad Omar)	do.	28,000
Do.		Takht Rustam Stone Transportation Co.	Samangan Province	3,000
Talc		Amin Karimzai Ltd. and HZM Marmi e Pietre Ltd.	Khogyani and Shinwari Districts, Nangarhar Province	640,000

^{e}Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

[1] The start date for Aynak Mine production was not yet determined.

THE MINERAL INDUSTRY OF AUSTRALIA

By Omayra Bermúdez-Lugo

In 2014, Australia remained one of the world's leading mineral-producing nations, accounting for more than 40% of world production of lithium; 32%, of bauxite; more than 20%, of iron ore; 19%, of alumina; 17%, of industrial diamond and manganese; more than 15%, of industrial garnet; 15%, of lead; 10%, of nickel; 9%, of gold; about 5%, of copper; and nearly 5%, of cobalt (Bray, 2016a, b; Brininstool, 2016; Corathers, 2016; George, 2016; Guberman, 2016; 2016; Jaskula, 2016; Kuck, 2016; Olson, 2016; Shedd, 2016).

Minerals in the National Economy

In fiscal year 2014, which began on July 1, 2013, and ended on June 30, 2014, mining accounted for 8.7% of Australia's gross domestic product (GDP). In terms of value added, mining output as reported by the Department of Industry, Innovation, and Science decreased by 7.4% to AUD118.3 billion (US$96.6 billion[1]). The largest decreases in value added output was in iron ore mining, which decreased by 20.7% to AUD45.5 billion (US$37.1 billion), and in coal mining, which decreased by 15.4% to AUD15.9 billion (US$13 billion). Employment in mining continued to be affected by the downturn in mining investment. As of June 2014, the mineral sector employed about 173,000 people, which represented a 7% decrease compared with mining employment in June 2013 (Department of Industry, Innovation, and Science, 2015a, p. 11; Australian Bureau of Statistics, 2016a, b).

For the past decade, Australia's economy benefited from a significant boom in mining investment. Most of this investment was driven by an increase in the international price of, and demand for, the country's key mineral commodity exports—particularly coal and iron ore—and by increased demand from China, which was Australia's leading mineral export market. Increased demand for Australia's minerals also led to a substantial increase in the demand for mining-related labor, which was estimated to have increased threefold to 192,000 people between August 2003 and November 2013. Most of these jobs were in the construction of building and transportation infrastructure to support mining activities; only 2% of the jobs were directly related to mining operations (Department of Industry, Innovation, and Science, 2014, p. 47, 83–85).

In 2014, the persistently low international prices of many of Australia's key minerals forced some companies to shut down mining operations and to place others on care-and-maintenance status. Shutdowns included United States-based Alcoa Inc.'s Point Henry aluminum smelter and Henry and Yennora rolling mills, and Consolidated Minerals Ltd. of the United Kingdom's Coobina chromium mine. Mining operations placed on care-and-maintenance status in 2014 included Norseman Gold plc of Australia's gold operations in Western Australia and Vedanta Resources plc of the United Kingdom's Mount Lyell underground copper mine. More than 200 employees were laid off at the Mount Lyell Mine. Operations at Rio Tinto Ltd.'s Gove alumina refinery in the Northern Territory were also curtailed during the year. Bracken Resources Pty Ltd.'s Hillgrove antimony mine remained on care-and-maintenance status. Several mines also opened during the year, including the Bald Hill bauxite mine, the Cadia East copper and gold mine, and the Tropicana gold mine. Exploration projects at an advanced stage included Rio Tinto's Bowen Basin coking coal project, the Pilbara iron ore project, and United States-based Chevron Corp.'s Gorgon LNG project (Validakis, 2014; Vedanta Resources, 2014; Alcoa Inc., 2015, p. 12; Chevron Corp., 2015a, p. 3; Consolidated Minerals Ltd. 2015, p. 2, 36; Rio Tinto Ltd., 2015, p. 9, 38).

In calendar year 2014, foreign direct investment (FDI) in mining accounted for AUD32.8 billion (US$26.8 billion), or 57% of Australia's FDI net inflows, which were valued at AUD57.5 billion (US$47 billion). This represented a 2.4% increase in FDI net inflows in 2014 compared with those of 2013. The United States accounted for the largest share (31%) of the net inflows, which decreased by 24.5% in 2014 to AUD18.2 billion (US$14.9 billion) from AUD24.1 billion (US$19.7 billion) in 2013. Net inflows of FDI from European Union countries—Australia's second largest source of FDI in 2014—decreased by 23.6% to AUD8.72 billion (US$7.12 billion) from AUD11.4 billion (US$9.32 billion) in 2013. Other significant sources of FDI in 2014 were, in order of the value of investment, the Netherlands, Canada, Hong Kong, Japan, and Singapore. Information on net inflows of FDI from China was not available for 2014 (Department of Foreign Affairs and Trade, 2015b, p. 33–34, 62).

In fiscal year 2014, capital expenditures in the mineral sector as a whole decreased by 16% to AUD76.1 billion (US$62.2 billion) compared with those of 2013. Mineral exploration spending decreased in all States and at both the brownfield (existing) and greenfield (new) project levels. Mineral exploration spending (excluding petroleum) decreased by 25% to AUD1.6 billion (US$1.3 billion) and petroleum exploration spending decreased by 21% to AUD3.8 billion (US$3.1 billion). Exploration spending for brownfield projects decreased by 24%, and that for greenfield projects, by 29% (Department of Industry, Innovation, and Science, 2015b, p. 14–15).

Government Policies and Programs

Land ownership in Australia is divided into two overarching categories: freehold land or land that is held by traditional owner groups (such as Aboriginal and Torres Strait Islander land groups), and nonfreehold land or public land, commonly known as Crown land. Mineral resources, irrespective of whether they are located on freehold or Crown land, are owned by the Government of Australia. The right to mine these minerals is contained in the respective States' laws governing mineral rights (Australian Trade and Investment Commission, 2016).

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[1] Where necessary, values have been converted from Australian dollars (AUD) to U.S. dollars (US$) at an average rate of AUD1.22 = US$1.00 for 2014.

In Australia's three-tiered Government system—local, State, and Federal—each State establishes its own mineral sector legal framework and has the authority to grant mining rights. All States and Territories, with the exception of the Australian Capital Territory, have identified mineral resources and established mineral industries. States, however, do not engage in commercial exploration or development of minerals, which is carried out by the private sector. Federal and State or Territory Governments invest in the collection and release of geoscientific data. The Federal Government sets national policy regarding the mineral sector as a whole, including the regulation of offshore mining operations, FDI guidelines, and taxation policy. The administration of offshore mineral resources is overseen by the National Offshore Petroleum Titles Administrator. Environmental and safety issues are overseen by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA). States and Territories manage and allocate mineral and petroleum property rights onshore and in coastal waters. They also regulate mining operations and oversee the adherence to environmental, occupational health, and safety laws; collect royalties; and oversee other mineral-related laws and regulations that are not covered by Australia's Constitution (Geoscience Australia, 2015, p. 18).

The NOPSEMA is the sole environmental assessor for offshore natural gas and petroleum projects. Offshore mineral resources are owned and administered by the respective States and Territories only for areas within 3 nautical miles from the shoreline and extending seaward to the outer limits of the continental shelf (Geoscience Australia, 2015, p. 18–19).

In July 2014, the Federal Government abolished the country's carbon tax law, making Australia the first developed country to repeal its greenhouse-gas emissions law. Australia, which was one of the world's top coal producers, was heavily reliant on electrical power from coal-burning power stations to meet its domestic demand for electricity. The Organisation for Economic Cooperation and Development (OECD) estimated that in 2012, on a per capita basis, Australia generated more greenhouse gas emissions than most OECD countries. In September, the Federal Government also repealed the Mineral Resources Rent Tax (MRRT). The MRRT, which was established in 2012, was a tax levied on the profits of coal and iron ore mining companies. The law required that coal and iron ore mining companies pay a 22.5% tax on profits generated in excess of $75 million (Organisation for Economic Cooperation and Development, 2014, p. 8, 15; Taylor, 2014; Taylor and Hoyle, 2014).

Australia was 1 of the 12 countries expected to become signatories to the Trans-Pacific Partnership (TPP) free-trade agreement. The TPP agreement sought to promote trade and investment across a range of sectors, including agriculture, minerals, and manufacturing, among countries of the Asia and the Pacific region. TPP countries, which in addition to Australia include Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, the United States, and Vietnam, were estimated to represent nearly 40% of the GDP and to have imported about AUD107 billion (US$87 billion) in Australian goods and services in fiscal year 2014. Once in effect, the TPP agreement would eliminate existing tariffs on key Australian mineral exports, such as coal, copper, iron ore, liquefied natural gas (LNG), nickel, and petroleum, entering TPP countries. The TPP agreement would also allow for Australian investors to apply for an exemption from the 49% foreign-equity limit on foreign ownership of uranium mines in Canada, for Australian companies to participate in investments in the energy sector of Mexico, and for Australian companies to make investments in the mineral sectors of Brunei and Malaysia (Department of Foreign Affairs and Trade, 2016).

Production

Australia continued to be among the world's leading producers of such mineral commodities as bauxite, coal, cobalt, copper, gem and near-gem diamond, gold, gypsum, ilmenite, iron ore, lead, lithium, manganese, nickel, phosphate rock, rare-earth elements, rutile, salt, silver, tin, uranium, zinc, and zircon. Mineral commodities for which a slight increase (5% or less) in output was reported in 2014 compared with that of 2013 included coal (bituminous and subbituminous), copper (primary, secondary, and smelted), crude petroleum, gold (mine output), lead (mine output), manganese, nickel (mine output), salt, silver (mine output), and zinc (mine output). Those mineral commodities for which an increase in output in 2014 was greater than 5% but equal to or less than 10% included cobalt (refined) and copper (primary, refined). Mineral commodities for which an increase in output was 10% or greater included barite, gypsum, nickel (matte), tin (mine output), tungsten, and zircon concentrates (table 1).

Mineral commodities for which a modest decrease in output was reported in 2014 compared with that of 2013 included alumina, aluminum, bauxite, copper (mined), crude steel, gold, lead (primary, refined), petroleum refinery products, and zinc (smelted, primary); those for which a decrease in output in 2014 was greater than 5% but equal to or less than 10% included cobalt (mine output) and rutile. Mineral commodities for which a decrease in output in 2014 was 10% or greater included diamond, garnet, ilmenite, lead (bullion), nickel (refined), silver (refined), and uranium (U_3O_8). Production was estimated for antimony, cadmium (refined), cement, feldspar, ferroalloys, gold (secondary refined metal), iron ore, lead (secondary), leucoxene, lignite, lime, limestone, lithium (spodumene), magnesium (magnesite), palladium, phosphate rock, pig iron, platinum, rare-earth minerals, construction sand, sand and gravel, silica, soda ash, semimanufactured steel products, and sulfur (table 1).

Structure of the Mineral Industry

The majority of mining operations in Australia were privately owned. In 2014, the share of foreign ownership in Australian businesses, including mining companies, was 29.3%. As of June 30, 2014, the mineral sector had the highest proportion (33.5%), across all industries, of foreign ownership in Australian businesses. About 22.5% of mining companies operating in the country had foreign ownership that exceeded 10% equity. The mineral sector also accounted for the largest share (38.4%) of the stock of FDI in the country in 2014 (calendar year), which was valued at AUD264.7 billion (US$216.2 billion). In 2014, mining also accounted for a significant share (25%) of Australian companies' direct investments abroad, which were valued at AUD135.2 billion (US$110.5 billion) (table 2: Department of Foreign Affairs and Trade, 2015b, p. 12, 39–40, 62–64).

Mineral Trade

The value of Australia's exports of goods and services increased by 2.5% in 2014 to AUD327 billion (US$267 billion); about 80% of these exports were shipped to member countries of the Asia and the Pacific Economic Cooperation forum (APEC).[2] Australia's top five export markets within the APEC were China, which accounted for 30% of total exports, followed by Japan, 15.4%; the Republic of Korea, 6.7%; the United States, 5.7%; and New Zealand, 3.7%. Singapore and India were also important APEC export markets, accounting for 3.7% and 3.5%, respectively, of total exports of goods and services. The value of Australia's total merchandise exports (goods only, including reexports and beneficiated and manufactured goods) was about AUD266 billion (US$217 billion). Exports of Australia-produced goods (not including reexports) were valued at AUD256 billion (US$209 billion); nonfuel minerals accounted for nearly 35% of these exports, and fuel minerals, nearly 28% (Department of Foreign Affairs and Trade, 2015a, p. 36, 43, 62).

In 2014, Australia exported about 18 million metric tons (Mt) of alumina, nearly 1.5 Mt of aluminum, 16.9 Mt of bauxite, about 1.1 Mt of copper, 9.8 million carats of rough diamond, 287 metric tons (t) of gold, nearly 717 Mt of iron ore, an estimated 844,000 t of iron and steel, 757,000 t of lead, 7.2 Mt of manganese ores and concentrates, 252,000 t of nickel, about 1 Mt of ilmenite, 35,000 t of leucoxene, 349,000 t of rutile, 1.5 Mt of zinc, and 753,000 t of zircon concentrates. Fuel mineral exports included about 135 million barrels (Mbbl) of crude petroleum and refinery feedstock, an estimated 24 Mt of LNG, 20 Mbbl of liquefied petroleum gas, 186 Mt of metallurgical coal, 201 Mt of thermal coal, and 5.7 Mbbl of petroleum refinery products (Department of Industry, Innovation, and Science, 2015c).

In terms of value, Australia's top five mineral commodity exports were iron ore, metallurgical coal, LNG, thermal coal, and gold. Together, these five commodities accounted for more than 72% of mineral export revenues in 2014 and generated about AUD135 billion (US$110 billion). Iron ore exports were valued at about AUD66 billion (US$54 billion); metallurgical coal, at AUD22 billion (US$18 billion); LNG, at AUD18 billion (US$14 billion); thermal coal, at AUD16 billion (US$13 billion); and gold, at AUD13 billion (US$11 billion) (Department of Industry, Innovation, and Science, 2015c).

China was Australia's leading goods export market, accounting for nearly 34% of total goods exports or AUD90 billion (US$74 billion). Japan, which was the second-ranked export market by value, accounted for 18.2% of total goods exports or AUD48 billion (US$39 billion); followed by the Republic of Korea, which accounted for 7.7% or AUD20 billion (US$17 billion); the United States, which accounted for 4.5% or AUD12 billion (US$9.7 billion); and India, which accounted for 3.3% or AUD8.9 billion (US$7.3 billion). Minerals represented about 82% of the total value of goods exported to China, 81% of the total value of goods exported to India, about 64% of the total value of goods exported to the Republic of Korea, more than 50% of the total value of goods exported to Japan, and nearly 4% of the total value of goods exported to the United States (Department of Foreign Affairs and Trade, 2015a, p. 80, 102, 106, 109, 115, 123).

The three leading mineral commodities exported to China in 2014, in terms of value, were iron ore and concentrates, which decreased in value by 3.9% to nearly AUD51 billion (US$41 billion); coal (not specified), which decreased in value by 8.3% to AUD8 billion (US$6.8 billion); and gold, which decreased in value by 13% to AUD7 billion (US$5.7 billion). Other mineral commodities exported to China included bauxite, copper, manganese, precious metal ore and concentrates, zinc ore and concentrates, and other nonspecified ores and concentrates. The top two mineral commodities exported to Japan were coal, which decreased in value by 13.3% to nearly AUD12 billion (US$9.7 billion) and iron ores and concentrates, which decreased in value by 12.1% to AUD8.4 billion (US$6.9 billion); those to the Republic of Korea were iron ore and concentrates, which decreased in value by 5.2% to AUD5.2 billion (US$4.2 billion) and coal, which increased in value by 2.3% to about AUD5.1 billion (US$4.2 billion); those to the United States were zinc, which increased by 101% to AUD200 million (US$163 million) and gold, which decreased by 35% to about AUD113 million (US$92 million); and those to India were coal, which increased by 8.3% to AUD5.2 billion (US$4.2 billion) and copper ore and concentrates, which decreased by about 23% (Department of Foreign Affairs and Trade, 2015a, p. 80, 102, 106, 109, 115, 123).

In 2014, the value of Australia's imports of goods and services increased slightly by 2.3% to nearly AUD337 billion (US$275 billion); about 66% of these imports came from member countries of the APEC forum. In terms of value, the five leading countries supplying imports to the APEC countries were China, which accounted for 16.1% of total imports; the United States, 12.4%; Japan, 5.9%; Singapore, 5.4%; and Germany 4.1%. Other important sources of imported goods and services were Malaysia (which supplied 3.8%), Thailand (3.8%), the Republic of Korea (3.7%), the United Kingdom (3.7%), and New Zealand (3.4%) (Department of Foreign Affairs and Trade, 2015a, p. 36, 44).

The value of Australia's total merchandise imports (goods only, including beneficiated and manufactured goods) was about AUD252 billion (US$206 billion). Nonbeneficiated or manufactured goods (unprocessed primary commodities, including minerals) were valued at nearly AUD59 billion (US$48 billion). Australia imported 640,000 carats of gem- and industrial-quality diamond (which also included diamond dust and diamond powder), 43,000 t of ferroalloys, about 3 Mt of iron ore, 1.6 Mt of steel (ingot), 230 Mbbl of petroleum feedstock, 209 Mbbl of petroleum refinery products, and 399,000 t of phosphate rock. Mineral imports, including other nonspecified minerals, were valued at about AUD49 billion (US$40 billion) (Department of Foreign Affairs and Trade, 2015a, p. 80; Department of Industry, Innovation, and Science, 2015c).

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[2] The Asia and the Pacific Economic Cooperation (APEC) forum was established in 1989 to promote economic cooperation among its member countries. As of June 30, 2014, member countries included: Australia, Brunei Darussalam, Canada, Chile, China, Indonesia, Japan, the Republic of Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Russia, Singapore, Thailand, the United States, and Vietnam.

Australia's leading sources of imported goods were, by value of the goods, China (which supplied 20.6% of the imports), the United States (11.4%), Japan (6.8%), Singapore (5.0%), and Germany (4.8%). The leading mineral commodity imported from the United States was gold, which increased in value by 58.3% to AUD379 million (US$310 million). The leading mineral commodities imported from Japan were refined petroleum, which decreased in value by 22.6% to AUD2.6 billion (US$2.2 billion), and gold, which decreased in value by 46% to AUD255 million (US$208 million). The leading mineral commodity imported from Singapore was refined petroleum, which increased in value by 29.9% to AUD4.5 billion (US$3.7 billion). Raw minerals were not among Australia's leading imported goods from China or Germany (Department of Foreign Affairs and Trade, 2015a, p. 80, 102, 106, 109, 116, 123).

Commodity Review

Metals

Bauxite and Alumina and Aluminum.—In 2014, Australia remained the world's leading producer of bauxite; the country was also the second-ranked producer of alumina after China and was among the world's top 10 producers of aluminum. Australia accounted for 32% of the world's mined bauxite, nearly 19% of the world's alumina output, and about 3% of the world's aluminum output. Bauxite was mined at the Bald Hill Mine in Tasmania; the Gove Mine in the Northern Territory; the Boddington-Worsley, the Huntly, and the Willowdale Mines in Western Australia; and the Weipa Mine in Queensland. In 2014, Australia was estimated to have accounted for more than 20% of the world's reserves of bauxite (table 3; Bray, 2016a, b).

Western Australia remained Australia's leading bauxite-producing State, accounting for 58.3% of the country's total bauxite output, followed by Queensland, 33.4%, and the Northern Territory, 8.3%. In 2014, about 88% of Australia's alumina output was exported, but information regarding the specific country destinations for these exports was not available. Australia exported about 86% of its aluminum output; about 35% of these exports were shipped to Japan; 20%, to the Republic of Korea; 13%, to Taiwan; 8%, to Thailand; and 4% each, to Indonesia and Malaysia (Department of Industry, Innovation, and Science, 2015c).

The Bald Hill bauxite mine was commissioned on December 9, 2014. The mine, which was located near the town of Campbell in northern Tasmania, was the first bauxite mine to open in the country in more than 35 years. The Bald Hill Mine had an annual production capacity of 900,000 t. The first bauxite shipments were expected to begin during the second quarter of 2015. Australian Bauxite Ltd., which was the company that operated the mine, was also exploring for bauxite at the Binjour project. The Binjour project was located in central Queensland and was reported to be prospective for silica-free gibbsite trihydrate bauxite (Australian Bauxite Ltd., 2015).

Alcoa Inc., through its subsidiary Alcoa World Alumina and Chemicals (AWAC), operated the Huntly and Willowdale Mines, which were located in the Darling Range of Western Australia. The Huntly Mine supplied bauxite to AWAC's Kwinana and Pinjarra alumina refineries and the Willowdale Mine to the Wagerup refinery, all of which were located in Western Australia. In August 2014, Alcoa completed the permanent closure of the Point Henry aluminum smelter because it had no prospects for profitability. A demolition and remediation program for the smelter began in late 2014 and was expected to be completed by the end of 2018. Alcoa also announced the closure of its Point Henry and Yennora rolling mills, which supplied can sheet metal to domestic and Asian markets. The rolling mills were closed owing to excess can sheet capacity in the region. Demolition and remediation activities were to begin in 2015 and were expected to be completed by the end of 2018 (Alcoa Inc., 2015, p. 12, 57).

A feasibility study was underway for Rio Tinto's South of Embley bauxite project. The project, which was located at Cape York in Queensland, consisted of the development of a mine, port, and other mine-related infrastructure. During the initial phase of the project, the mine was expected to produce nearly 23 million metric tons per year (Mt/yr) of bauxite with a future target of 50 Mt/yr. The development of the South of Embley Mine also would enable the continuity of supply to the company's two Gladstone alumina refineries. Rio Tinto reported that lower bauxite inventories in China could support the company's exports to China in 2015, especially if Indonesia's ban on bauxite exports remained in place throughout the year (Rio Tinto Ltd., 2015, p. 7, 29).

In May, production at Rio Tinto's Gove alumina refinery was curtailed following the company's decision in 2013 to place the refinery on care-and-maintenance status by 2014. Rio Tinto planned to convert the Gove refinery into a bauxite export facility and to progressively ramp up bauxite exports to 8 Mt/yr. About 900 employees were to be laid off during the transition. As of December 31, 2014, the Yarwun alumina refinery's capacity was 3.4 Mt/yr (Rio Tinto Ltd., 2014, p. 41; 2015, p. 28, 216).

Chromium.—The Coobina chromite mine, which was located 80 kilometers (km) southeast of Newman in Western Australia, closed during the first quarter of 2014. Consolidated Minerals Ltd. had made the decision to close the mine in July 2013 owing to a decrease in ore grade and mine yield and an increase in operational costs. Remaining stocks of crushed ore were processed in January and exported to customers during the first quarter of 2014. Consolidated Minerals was Australia's sole producer of chromite ore (in the form of lump and sands) for use in the production of ferrochromium. On December 1, AusTin Mining Ltd. signed a memorandum of understanding with Compound Resources Pty Ltd. to develop an alluvial chromite deposit that had been discovered within AusTin's Marlborough exploration project (EPM 17768) in Queensland. The Marlborough project was prospective for cobalt, nickel, and platinum mineralization (AusTin Mining Ltd., 2014a; Consolidated Minerals Ltd. 2015, p. 2, 36).

Copper.—Australia produced about 5% of the world's mined copper output in 2014 and ranked sixth among the world's leading producers of mined copper. Most of the copper produced in the country came from mining operations located in Queensland, South Australia, and Western Australia, although some copper was also produced in New South Wales and Tasmania. Mined copper output decreased by about 3% in 2014 to 969,000 t from a revised 1,001,000 t in 2013. Production of blister copper increased by nearly 5% to 468,000 t, and that of refined copper, by nearly 6% to more than 500,000 t. In 2014, Australia was estimated to have accounted for about 12% of the world's copper reserves. South Australia accounted for about 31% of the country's mined copper output, followed by Queensland, 29%; New South Wales and Western Australia, 20% each; and Tasmania, less than 1% (tables 1 and 3; Department of Industry, Innovation, and Science, 2015c; Brininstool, 2016).

About 50% of Australia's copper ore and concentrate production was exported to China; 22%, to Japan; 12%, to India; 6%, to the Republic of Korea; and 5%, to the Philippines. The majority (47%) of refined copper exports were shipped to China, followed by Malaysia (about 21%), Japan (nearly 15%), Thailand (about 6%), Indonesia and Vietnam (nearly 3% each), and Taiwan (about 2%) (Department of Industry, Innovation, and Science, 2015c).

BHP Billiton Ltd., Glencore plc of Switzerland, Newcrest Mining Ltd., OZ Minerals Ltd., and Sandfire Resources NL were Australia's leading producers of copper. In 2014, BHP Billiton was in the process of completing a prefeasibility study for the expansion of the Olympic Dam underground polymetallic mine. The Olympic Dam operation was a fully integrated metallurgical complex. Its facilities included a grinding and concentrating circuit, a hydrometallurgical plant with solvent-extraction circuits for copper and uranium, and a recovery circuit for precious metals. Copper was also smelted and refined at the complex. In July, BHP Billiton submitted an application to the Government for the construction and operation of a heap-leach test plant. Construction of the test plant was expected to begin during the second half of 2015 and to be commissioned in late 2016 (BHP Billiton Ltd., 2015, p. 79, 82).

In 2014, Sandfire Resources increased production at its DeGrussa underground copper sulfide mine to 1.5 Mt/yr. Independence Group NL was in the process of completing an enhanced feasibility study (EFS) for the development of the Wilga and the Currawong copper-gold-lead-silver-zinc deposits, which are located in the town of Benambra in northeastern Victoria. The EFS was expected to be completed by yearend 2014 (Independence Group NL, 2014, p. 38; Sandfire Resources NL, 2014, p. 12).

Gold.—In 2014, Australia was the world's second-ranked producer of gold after China, accounting for about 9% of total world gold output. Most gold mines were located in Western Australia. Australia's total gold mine output increased by about 2% during the year to 274 t from a revised 268 t in 2013; primary refined gold output decreased by less than 1% to 304 t, and that of secondary refined gold was estimated to be 20 t. In 2014, Australia was estimated to have accounted for about 16% of the world's gold reserves (tables 1–3; George, 2016).

Western Australia accounted for nearly 70% of all gold produced in Australia, followed by Queensland, 6.0%; the Northern Territory, 4.8%; South Australia, 4.6%; Victoria, 2.4%; and Tasmania, less than 1%. Nearly 77% of the country's total primary refined gold came from domestic mines; about 95% of secondary refined gold came from imported sources. In 2014, Australia exported nearly 287 t of refined and unrefined gold bullion; 54% of these exports was shipped to China; nearly 25%, to Singapore; about 7%, to the United Kingdom; 5%, to India; and 5%, to Thailand (Department of Industry, Innovation, and Science, 2015c).

The Tropicana gold mine, which was owned and operated by AngloGold Ashanti (Australia) Ltd. (70%) and Independence Group NL (30%), was officially opened in June. At full capacity, the mine was expected to produce between 15,100 and 16,400 kilograms per year of gold (Tropicana Joint Venture, 2014).

Gold Corp. owned 100% interest in the country's only gold and silver refinery accredited by the London Bullion Market. In 2014, about 99% of Australia-produced dore was refined at the Perth Mint refinery, which was located in Western Australia. The refinery also processed gold mined in Fiji, Laos, Malaysia, New Zealand, Papua New Guinea, the Philippines, the Solomon Islands, and Thailand, and recycled gold from various countries in Asia (unspecified). The refinery's main markets for value-added gold cast bars were China and India. Gold was also exported to London in the form of 12.4-kilogram (kg) gold bars (reported as 400-troy-ounce good delivery bars). Refined silver was exported to international markets in the form of 31.1-kg silver bars (reported as 1,000-troy-ounce good delivery bars). Value-added cast silver bars were sold domestically and exported to international markets (destinations unspecified). Gold Corp. also minted gold and silver bullion coins for export at the Perth Mint. As of June 30, 2014, the Perth Mint employed 363 people (Gold Corp., 2015, p. 2, 10, 20).

Iron Ore.—In 2014, Australia was the world's second-ranked producer of iron ore after China. The country accounted for about 23% of the world's mine production of iron ore and for about 28% of the world's reserves of crude iron ore. In 2014, iron ore output was estimated to have increased by 21.9% to 746 Mt compared with a revised 612 Mt in 2013. About 98% of the iron ore produced in the country came from mining operations located in Western Australia; about 1.5%, in South Australia; and less than 1% each, in Tasmania and the Northern Territory. In 2014, Australia exported about 97% of its iron ore output. Nearly 80% of iron ore in the form of fines, lump, and pellets was exported to China; about 11%, to Japan; and 7%, to the Republic of Korea (table 1; Department of Industry, Innovation, and Science, 2015c; Tuck, 2016).

BHP Billiton, CITIC Pacific Mining Management Pty Ltd. (CITIC), and Rio Tinto were Western Australia's leading iron ore producers in 2014. These three companies continued to invest in iron ore capacity expansion projects. BHP Billiton operated an integrated system of mines in the Pilbara region, which was known as the Western Australia Iron Ore Operations (WAIO), and planned to increase production capacity to 290 Mt/yr. In response to demand from China, BHP Billiton launched an expansion program for the WAIO in the early 2000s and since then has completed eight expansion programs with the target of increasing iron ore production capacity to 290 Mt/yr (BHP Billiton Ltd., 2015, p. 17, 40).

The WAIO consisted of four main mining areas—the Mount Goldsworthy, the Mount Newman, the Jimblebar, and the Yandi joint-venture operations. BHP Billiton sold lump and fines from its WAIO operations to domestic and international steel mills, including steel mills in China, Hong Kong, Japan, the Republic of Korea, Singapore, Switzerland, and Taiwan. In 2014, BHP Billiton completed the first phase of its capacity expansion program at the Jimblebar Mine; the expansion was expected to increase capacity to 35 Mt/yr by mid-2015, and to further expand capacity to 55 Mt/yr (expected date of commissioning not indicated). At the Mount Goldsworthy operation, production from the Yarrie Mine was suspended during the year as the company focused on improving productivity at its other mining operations (BHP Billiton Ltd., 2015, p. 17, 40–41).

CITIC reported that, despite delays in 2014, the commissioning of production lines No. 3 and 4 at the Sino iron project, which was Australia's largest magnetite iron ore mine, was scheduled for 2015. The commissioning of lines No. 5 and 6 was scheduled for 2016. The Sino iron project is located at Cape Preston, which is about 100 km southwest of the city of Karratha in Western Australia's Pilbara region. Iron ore concentrate from the Sino iron project was shipped to CITIC's steel plants and other customers in China. Upon completion, the project was expected to have six production lines with the capacity to produce a total of 24 Mt/yr of magnetite concentrate. CITIC Pacific Mining Management Pty Ltd. was a subsidiary of Hong Kong-based CITIC Pacific Ltd., which was a member of China's state-owned CITIC Group (CITIC Ltd., 2015, p. 26).

The first phase of Rio Tinto's 290-Mt/yr iron ore expansion project at its Pilbara region mines was achieved in May; a further expansion to 330 Mt/yr of iron ore was expected to be commissioned in 2015. Rio Tinto reported that an investment decision regarding the development of the Silvergrass Mine was deferred until 2016 and that phase 2 of the expansion of the Western Turner Syncline, which was expected to increase production capacity at the Hamersley operations by 7 Mt/yr, had been approved. Rio Tinto operated 15 mines in the Pilbara region. In January, severe weather conditions from a tropical storm caused the temporary suspension of all Rio Tinto's coastal mining operations in the Pilbara region and at other mining operations in the region (Rio Tinto Ltd., 2015, p. 36–37).

Lead, Silver, and Zinc.—In 2014, Australia ranked second after China among the world's leading producers of lead and zinc. The country also ranked second among the world's producers of silver. Australia accounted for nearly 15% of world mine production of lead and nearly 12% of world mine production of zinc. Lead mine production increased slightly to 728,000 t in 2014 from 711,000 t in 2013. Silver output remained at about the same level as that of 2013, and zinc mine output increased slightly to 1.56 Mt in 2014 from 1.52 Mt in 2013. Lead and silver were produced in New South Wales, Queensland, South Australia, and Tasmania, and zinc was produced in New South Wales, the Northern Territory, Queensland, South Australia, Tasmania, and Western Australia (tables 1 and 2; George, 2016; Guberman, 2016; Tolcin, 2016).

Queensland accounted for nearly 64% of Australia's mine production of lead, followed by New South Wales, 14%; Western Australia, 12%; the Northern Territory, 7%; and Tasmania, 4%. Nearly 64% of lead concentrate exports went to China, 15% to the Republic of Korea, 11% to Japan, and 10% to European Union countries. Lead bullion containing some precious metals, mainly silver, was exported to the United Kingdom. About 30% of refined lead exports went to Malaysia; nearly 24%, to India; about 19%, to the Republic of Korea; 17%, to Vietnam; nearly 7%, to Thailand; and nearly 4%, to South Africa. Queensland accounted for about 76% of Australia's mine production of silver, followed by Western Australia, nearly 7%; New South Wales, 6%; Tasmania, nearly 5%; and the Northern Territory and South Australia, 3% each (Department of Industry, Innovation, and Science, 2015c).

Queensland accounted for nearly 65% of Australia's mined zinc output, followed by the Northern Territory, about 14%; New South Wales, about 9%; and Tasmania and Western Australia, nearly 6% each. Nearly 35% of zinc concentrates exports went to China; about 19%, to the Republic of Korea; 11%, to Spain; 10%, to Belgium and Luxembourg; 10%, to Japan; nearly 5%, to the Netherlands; 3.7%, to Germany; about 1%, to Thailand; and less than 1%, to India. Nearly 25% of Australia's refined zinc was exported to the United States; 24%, to China; 18%, to Taiwan; 17%, to Hong Kong; 8%, to Indonesia; 6%, to Malaysia; and 2%, to India (Department of Industry, Innovation, and Science, 2015c).

Nickel.—Most nickel mined in Australia came from Western Australia. In 2014, Australia produced about 10% of the world's mined nickel output. Mined output of nickel increased by about 4% to 244,000 t in 2014 from 234,000 t in 2013. Nickel matte production increased by 20% to 84,000 t in 2014 from 70,000 t in 2013, and production of refined nickel decreased by 19.7% to 114,000 t in 2014 from 142,000 in 2013. BHP Billiton held the largest nickel operation (Nickel West) in the country. The Nickel West operations included the Leinster and the Mount Keith open pit mines. Production at the Leinster Perseverance underground mine was suspended in 2013 following a seismic event that rendered the underground operations unsafe. The mine remained closed in 2014. In May, BHP Billiton announced that it was considering the sale of all its Nickel West assets in Australia, which, in addition to the mines, included concentrators, the Kalgoorlie smelter, and the Kwinana refinery (table 1; BHP Billiton Ltd., 2015, p. 44–45; Kuck, 2016).

In September, Poseidon Nickel Ltd. acquired the rights to the Lake Johnston Nickel Operation (LJNO) from MMC Norilsk Nickel of Russia. In December, the company announced that it had completed a bankable feasibility study for the redevelopment of the LJNO. The LJNO comprised the Emily Ann and the Maggie Hays underground nickel mines, which had operated during the 1990s but were closed in 2007 and 2009, respectively, owing in part to the onset of the 2008–9 global financial crisis. A Joint Ore Reserves Committee (JORC) mineral resource study report completed in October estimated indicated and inferred resources at the Maggie Hays Mine to be 3.8 Mt at an average grade of 1.41% nickel. The LJNO is located 540 km east of Perth in Western Australia. Poseidon also planned to redevelop the Mount Windarra underground nickel mine for which the company began a drilling campaign in 2014. As of July, a JORC mineral resource study report estsimated indicated and inferred mineral resources for the Mount Windarra Mine to be about 4.4 Mt at an average grade of 1.64% nickel (Poseidon Nickel Ltd., 2014a, b).

Metals X Ltd. continued to explore for nickel and cobalt at its Central Musgrave project (CMP). The CMP straddles the boundaries of the Northern Territory, South Australia, and Western Australia and consists of the Claude Hills nickel deposit, the Wingellina nickel-cobalt deposit, and the Mt. Davies exploration prospects. The Wingellina deposit was reported to be one of the world's largest undeveloped nickel-cobalt limonite deposits. In 2014, Metals X was in the process of completing long-lead-time studies required for the completion of a definitive feasibility study, including studies for the development of key mining-related infrastructure, such as rail, roads, and ports. The company also focused on the completion of a Public Environmental Review, which was required for final approval by the Environmental Protection Authority of Western Australia, and completed the buyout of the interests of Rio Tinto in the Mt. Davies joint venture. As of June 30, 2014, measured, indicated, and inferred mineral resources at Wingellina were estimated to be 183.2 Mt at an average grade of 0.98% nickel, 0.08% cobalt, and 47% iron oxide. The total ore reserve was estimated to be 167.5 Mt at an average grade of 0.98% Ni, 0.08% cobalt, and 47.3% iron oxide (Metals X Ltd., 2015, p. 16, 122).

Tin.—AusTin Mining Ltd. completed a feasibility study, which confirmed the technical and economic viability of the Taronga Tin Project (TTP). The TTP, which is located about 7 km northwest of Emmaville in northern New South Wales, had been explored previously by BHP Billiton and Newmont and was considered to host one of the world's largest undeveloped hard-rock tin deposits. A mineral resource estimate conducted in August 2013 concluded that the project hosted 36.3 Mt at average grades of 0.16% tin, 0.07% copper, and 3.8 grams per metric ton silver. Further metallurgical test work was to be carried out during the completion of a definitive feasibility study for the project. The Taronga project was expected to produce about 2,800 metric tons per year (t/yr) of tin and to begin producing in 2017 (AusTin Mining Ltd., 2014b, p. 5–7).

Metals X planned to reprocess the tailings from its Renison tin project to recover tin and copper. The Renison tin project is located about 15 km northeast of Zeehan on Tasmania's west coast. The total mineral resource estimate for the tailings reprocessing project was estimated to be 21.2 Mt at an average grade of 0.45% tin and 0.21% copper. A definitive feasibility study completed for the project in 2009 concluded the possibility of developing a 5,300-t/yr tin operation and a 2,000-t/yr copper operation for a period of 10 years. During the year, Metals X disposed of its Collingwood tin project in Queensland. The project had been on care-and-maintenance status since 2012 (Metals X Ltd., 2015, 14–15).

Titanium and Zirconium.—Iluka Resources Ltd. was the leading heavy-mineral producer in Australia, and its operations were located in the Eucla basin in South Australia, the Murray basin on the border of New South Wales and Victoria, and the Perth basin in Western Australia. The company produced 177,000 t of rutile and 271,000 t of ilmenite in 2014 from its operations in Australia, which was an increase of 40% and a decrease of 31%, respectively, compared with production in 2013. All Iluka's synthetic rutile kilns were idled in 2014 in response to reduced market demand (Iluka Resources Ltd., 2015, p. 14, 18).

In 2014, Iluka was in the process of completing a definitive feasibility study for the Cataby deposit, which is located north of Perth in Western Australia, and for the West Balranald and Nepean rutile-rich mineral sands deposits in the Murray basin. Cataby is an ilmenite deposit prospective for rutile and zircon. Once in production, the heavy-mineral concentrate produced at Cataby would be processed at Iluka's Narngulu mineral separation plant. Part of the expected production of ilmenite was to be used as feed for the production of synthetic rutile. The West Balranald and Nepean deposits also were prospective for ilmenite and zircon mineralization. The company also commenced a prefeasibility study for the Atacama, the Sonoran, and the Typhoon mineral sand deposits, which are located in the Eucla basin in South Australia. These deposits were also reported to be prospective for the production of ilmenite in addition to zircon (Iluka Resources Ltd., 2015, p. 24–25).

Industrial Minerals

Diamond.—Rio Tinto was Australia's leading diamond producer. The company held 100% interest in the Argyle underground mine, which is located 120 km southwest of Kununurra in Western Australia. Rio Tinto also operated a rough diamond-cutting and -polishing factory in Australia where it processed its high-value pink diamond from the Argyle Mine for export to international markets. In 2014, Rio Tinto reported that production from the Argyle Mine had been negatively affected by the transition to underground mining owing mostly to the processing of lower grade tailings as underground production ramped up and to a maintenance shutdown, which affected the operation of the mine's underground crushers. The Argyle Mine was expected to ramp up to full nameplate capacity by 2015. The mine produced nearly 9.3 million carats of diamond in 2014 (Rio Tinto Ltd., 2015, p. 32, 197).

Lithium.—Australia was the world's leading producer of lithium. In 2014, the country was estimated to have produced about 425,000 t of spodumene, which was equivalent to about 13,300 t of contained lithium, and to have about 11% of the world's lithium reserves. Lithium output came from the Greenbushes and the Mount Cattlin Mines in Western Australia. At least three companies—Altura Mining Ltd., Reed Resources Ltd., and Mineral Resources Ltd.—explored for lithium in 2014. Altura explored for lithium at the Pilgangoora project in the Pilbara region of Western Australia, and Reed Resources (70%), in a joint venture with Mineral Resources (30%), explored for lithium at the Mount Marion project southwest of Kalgoorlie, Western Australia (Jaskula, 2016).

Salt and Gypsum.—Rio Tinto produced industrial salt by solar evaporation of seawater at Dampier and Port Hedland and from underground brines at Lake MacLeod, all of which were located in Western Australia. Salt was also produced by other smaller producers in Queensland, South Australia, Victoria, and Western Australia. Rio Tinto's production, which in 2014 was about 9.9 Mt, was exported mainly to chemical industry markets in Asia. Rio Tinto produced 6.8 Mt of salt (production represented Rio Tinto's share only) from Dampier, Port Hedland, and Lake MacLeod in 2014. Rio Tinto also produced gypsum at the Lake MacLeod operation (Rio Tinto Ltd., 2015, p. 33, 197, 213).

Mineral Fuels and Related Materials

Coal.—Australia was among the world's leading producers of mined coal. Most of the coal produced in the country came from mining operations located in Queensland and New South Wales, although coal also was produced in South Australia, Tasmania, Victoria, and Western Australia. In 2014, mined coal output (bituminous and subbituminous) increased by about 5% to 571 Mt compared with a revised 544 Mt in 2013. Queensland accounted for about 52% of the country's mined coal output, followed by New South Wales, nearly 46%, and Western Australia, 1.3%. About 26% of Australia's high-quality metallurgical coal exports went to China; 25%, to India; nearly 18%, to Japan; nearly 13%, to European Union countries; 7%, to the Republic of Korea; about 4%, to Taiwan; and 2%, to Brazil. About 39% of thermal coal exports went to Japan; 23%, to China; 17%, to the Republic of Korea; and 10%, to Taiwan (table 1; Department of Industry, Innovation, and Science, 2015c).

BHP Billiton held interest in the Queensland Coal asset in partnership with Mitsubishi Corp. of Japan, a 50–50 joint venture. Queensland Coal comprised the BHP Billiton Mitsubishi Alliance (BMA) and the BHP Billiton Mitsui Coal (BMC) properties, which are located in the Bowen basin in Central Queensland. BMA operated the Blackwater, the Broadmeadow, the Caval Ridge, the Daunia, the Goonyella Riverside, the Gregory Crinum, the Peak Downs, and the Saraji Mines. The Daunia Mine was commissioned in September 2013, and the Caval Ridge Mine was commissioned in June 2014. Total coal production from the BMA mines during fiscal year 2014 was 29.3 Mt. BMC, which operated the Poitrel and the South Walker Creek open pit metallurgical coal mines, produced a total of 8.3 Mt of coal in fiscal year 2014 (BHP Billiton Ltd., 2015, p. 42–43).

BHP Billiton also held a 100% interest in the Illawarra Coal asset, which comprised the Appin, the Dendrobium, and the West Cliff Mines in New South Wales. These mines supplied metallurgical coal to BlueScope Steel Ltd.'s Port Kembla steelworks and to other domestic markets. Coal also was exported internationally through the Port of Kembla. In fiscal year 2014, production from these mines was 7.5 Mt. An expansion program underway at the Appin Mine was expected to increase total production capacity from the Illawarra Coal asset to 9 Mt/yr by 2016. This new output would help counterbalance the loss in production from the closure of the West Cliff Mine; reserves were expected to be depleted by 2017 (BHP Billiton Ltd., 2015, p. 42).

In July, Centennial Coal Co. Ltd. placed its Newstan Colliery Mine on care-and-maintenance status, citing unfavorable coal market conditions and increased operating costs. Forty-five of the 148 employees were transferred to the company's Myuna and Mandalong Mines; 103 employees were retrenched. The Newstan Colliery Mine had been closed from 2009 to 2011 also owing to unfavorable coal market conditions. Despite its temporary closure, Centennial planned to continue with the mine's expansion project until market conditions improved. In October, the company announced that it also planned to place the Angus Place Mine on care-and-maintenance status in April 2015 owing to a reduction in domestic coal consumption resulting from the suspension of operations at the Wallerawang power station. An undisclosed portion of the mine's 268 employees were transferred to the company's Springvale Mine and 30 employees were transferred to the Clarence Mine. Centennial expected both mines to reopen when coal market conditions improved. Centennial supplied about 45% of New South Wales' thermal coal needs for use in coal-fired electricity generation. As of yearend, the company employed about 1,500 people. Centennial was wholly owned subsidiary of Banpu Public Co. Ltd. of Thailand and operated six coal mines in New South Wales (Centennial Coal Co. Ltd., 2015, p. 1, 9).

In addition to the Angus, the Mandalong, the Myuna, and the Newstan coal mines, Centennial held interest in four other coal mines in Australia, including the Airly, the Charbon, the Clarence, and the Springvale Mines. In 2014, the Airly Mine produced 481,587 t of coal and employed 59 people; the Clarence Mine had record production of 2.55 Mt of coal and employed 236 people; the Mandalong had record production of about 5.94 Mt of coal and employed 377 people; the Myuna Mine had record production of about 1.87 Mt of coal and employed 257 people. Although operations were suspended at the Newstan Mine during the second half of the year, the mine produced 530,845 t; the Springvale Mine had record production of about 3.49 Mt of coal and employed 343 people. Coal reserves at the Charbon Mine were near depletion; underground mining operations ceased in April 2014, and open pit operations were expected to cease in 2015. The Charbon Mine produced 779,565 t in 2014 and as of yearend employed 17 people (Centennial Coal Co. Ltd., 2015, p. 20–23).

Natural Gas.—Australia was expected to become the world's leading exporter of liquefied natural gas (LNG) by 2020 following the commissioning of seven LNG projects, which were expected to come online within the next 5 years. Two of these projects included the 15.6-Mt/yr Gorgon LNG project, which is located on Barrow Island off the northwest coast of Western Australia, and the 8.9-Mt/yr Wheatstone onshore LNG project, which is located near Onslow in the West Pilbara region of Western Australia. In 2014, Chevron invested $7.1 billion in the development and construction of these two projects. The Gorgon project was expected to be commissioned in 2015, and the Wheatstone project, in 2016. Natural gas to supply the Gorgon LNG project was to be sourced from the Gorgon and the Jansz-lo fields, which were also under development and expected to come online in mid-2015. Majority interest in the Gorgon project was held by Chevron (47.3%), Exxon Mobil Corp. of the United States (25%), and Royal Dutch Shell plc of the Netherlands (25%). About 80% of the natural gas needed to supply the Wheatstone onshore LNG project would be sourced from the Wheatstone and the Lago fields, which were operated by Chevron in joint venture with the Kuwait Foreign Petroleum Exploration Co., the Kyushu Electric Power Co. of Japan, and PE Wheatstone Pty. Ltd. Other LNG projects included the 8.9-Mt/yr Ichthys project, which was expected to be commissioned in 2017; and the 3.6-Mt/yr Prelude project, which was expected to be online by 2017. Australia was expected to produce 82.4 billion cubic meters of natural gas in fiscal year 2015 and to increase production to 146.8 billion cubic meters by fiscal year 2019 (Chevron Corp. 2015a, p. 3, 75; 2015b; Department of Industry, Innovation, and Science, 2015a, p. 42; 2015b, p. 63–64).

Outlook

Australia's Department of Industry, Innovation, and Science reported that although the mining investment boom had passed, mineral output in Australia was likely to continue to increase as the mineral sector moved from a mining investment phase to a mineral production phase. This projected increase in production was, for the most part, underpinned by the estimated AUD400 billion (US$327 billion) of investments in the development of mineral projects in the past 11 years. Over the medium and long terms, demand for Australia's mineral commodities is likely to increase based on the expected increase in consumption by developing economies, mostly countries in Asia. The recent slowdown in China's economy, Australia's largest mineral export market, could result in a significant decrease in demand for Australian mineral exports. This could continue to exert financial pressure on small-scale, high-cost mineral producers, forcing them to close mines or to place them on care-and-maintenance status. The Australian Government projects mining investment in the country to decrease by more than 25% between 2015 and 2016 and by more than 30% between 2016 and 2017 (Department of Industry, Innovation, and Science, 2015a, p. 25; 2015b, 2, 12).

Growth in Australia's output and exports of iron ore is expected to slow to about 4% per year over the medium term from a 15% annual rate of growth from 2010 to 2014. Exploration expenditures, however, are projected to increase as Australian producers look for new iron ore deposits to replace operations that are reaching life-of-mine capacity. Iron ore exports are projected to increase by 24% to 928 Mt by 2019. The Roy Hill Mine was expected to be operational by yearend 2015. Australia's thermal coal production is projected to increase to 265 Mt in 2019 owing to the rampup of mining projects to be commissioned in 2015 and 2016. Australia's thermal coal exports are projected to increase to 206 Mt in 2015, and to increase further to 222 Mt by 2019 (Department of Industry, Innovation, and Science, 2015b, p. 35, 37, 54–55).

In 2015, production of natural gas is expected to increase to 82.4 billion cubic meters, mostly as a result of the ramping-up of production at existing fields, and to further increase to 146.8 billion cubic meters by 2019. Australia is expected to become the world's leading LNG exporter by 2020; 25% of exports are expected to be shipped to China, and 13%, to the Republic of Korea. Australia's production of aluminum is projected to decrease to 1.5 Mt in 2019 as domestic supply is displaced by low-cost imports, and exports are projected to decrease to 1.3 Mt. Exports of alumina are expected to increase to 21.3 Mt in 2015. Production of bauxite will be supported by the development of the Bauxite Hills and South of Embley projects; bauxite exports are expected to increase to about 34.6 Mt by 2019 (Department of Industry, Innovation, and Science, 2015b, p. 63–66, 91, 93).

Copper mine production is expected to increase to 1 Mt in 2015, mostly as a result of the normalization of operations at the Olympic Dam Mine. Production is expected to increase to 1.3 Mt by 2020 owing to the development of new projects and higher production at existing mines. Increased production from existing mines, in particular the Cadia and the Prominent Hill Mines, is expected to help counterbalance the loss of production from the closure of the Golden Grove and the Leichhardt Mines. In 2016, refined copper production is expected to increase to 479,000 t owing mostly to the resumption of normal operations at the Olympic Dam Mine and increases at other operations. Australia's copper exports (total Cu content) are projected to increase to 1.3 Mt by 2019. Refined copper production, however, is expected to decrease to 239,000 t by 2019 as a result of the expected closure the Townsville refinery in 2016 (Department of Industry, Innovation, and Science, 2015b, p. 101–102).

In 2015, Australia's nickel exports (Ni content) are projected to increase to 262,000 t. Mined nickel production is expected to increase to 275,000 t in 2019, and exports of nickel are expected to reach 299,000 t. Refined nickel production is expected to decrease to 104,000 t mostly as a result of decreased production at Nickel West. Zinc mine production is expected to decrease to 1.6 Mt in 2019 (Department of Industry, Innovation, and Science, 2015b, p. 108–109, 113–114).

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TABLE 1
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless othewise specified)

Commodity		2010	2011	2012	2013	2014
METALS						
Aluminum:						
Bauxite, gross weight	thousand metric tons	68,414	69,976	76,282	81,119 [r]	78,633
Alumina	do.	19,956	19,399	21,357	21,528	20,475
Metal:						
Primary	do.	1,928	1,945	1,864	1,778	1,704
Antimony, Sb content of ores and concentrates		1,106	1,577	2,481	3,275	3,800 [e]
Cadmium, metal, smelter, refined[e]		350	390	380	380	380
Chromium:						
Chromite, gross weight		180,000	323,800	452,300	355,000 [r]	--
Chromite content[e]		65,000	120,000	160,000	130,000 [r]	--
Cobalt:						
Co content in laterite ore and Ni concentrate[3]		3,852	3,848	5,870 [r]	6,410 [r]	5,978
Metal, refined[4]		4,117 [r]	4,722 [r]	4,859 [r, 5]	4,981 [r]	5,419
Copper:						
Mine output, Cu content	thousand metric tons	870	958	914	1,001 [r]	969
Metal:						
Smelter, primary and secondary	do.	410	441	422	446 [r]	468
Refined, primary	do.	417	477	460	480 [r]	507
Gold:						
Mine output, Au content		261	260	252	268 [r]	274
Metal, refined:						
Primary		280	271	263	306 [r]	304
Secondary		71	48	45 [r]	23 [r]	20 [e]
Iron and steel:						
Iron ore:[e]						
Gross weight	thousand metric tons	433,000	488,000	520,000 [r]	612,000 [r]	746,000
Fe content	do.	271,000	277,000	312,000 [r]	367,000 [r]	448,000
Metal:						
Pig iron	do.	6,259	5,296 [r]	3,480	3,342 [r]	3,300 [e]
Ferroalloys:[e]						
Ferromanganese		138,000	146,000	106,000	144,000	162,000
Silicomanganese		131,000	130,000	51,000	110,000	119,000
Total		269,000	276,000	157,000	254,000	281,000
Steel, crude	thousand metric tons	7,408	6,538	4,903 [r]	4,646 [r]	4,412
Semimanufactured products[e]	do.	9,100	9,750	8,300	7,600	7,600
Lead:						
Mine output, Pb content	thousand metric tons	625	621	622	711	728
Metal:						
Bullion	do.	142	139	147	144 [r]	109
Refined:						
Primary	do.	178	187	160	177	176
Secondary, excluding remelt	do.	26	26	24	24	50 [e]
Manganese ore, metallurgical:						
Gross weight	do.	6,474	6,963	7,179 [r]	7,447 [r]	7,587
Mn content	do.	2,650	2,860	2,950	2,970	3,000 [e]
Nickel:						
Mine output, Ni content	do.	170	215	244	234	244
Matte	do.	54	57	66	70	84
Metal, smelter, refined Ni and Ni content of oxide	do.	108	110	129	142	114
Platinum-group metals:[e]						
Palladium, Pd content	kilograms	650	350	550	610	600
Platinum, Pt content	do.	130	100 [r]	160 [r]	176	180
Total	do.	780	450 [r]	710 [r]	790	780

See footnotes at end of table.

TABLE 1—Continued
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2010	2011	2012	2013	2014
METALS—Continued						
Silver:						
Mine output, Ag content		1,879	1,725	1,728 [r]	1,840	1,848
Metal, refined		634	990	781 [r]	1,222	944
Tin:						
Mine output, Sn content[6]		18,263	14,014	6,158	6,472	7,207
Metal, refined, secondary[e]		400	400	400	400	400
Titanium mineral concentrates, gross weight:						
Ilmenite	thousand metric tons	1,492	1,277	1,344	1,342 [r]	1,000
Leucoxene[e]		159,000	224,000	228,000	220,000	250,000
Rutile		438,000 [r]	474,000	439,000 [r]	232,000 [r]	212,000
Tungsten, mine output, W content		18	15	290	320	477
Zinc:						
Mine output, Zn content	thousand metric tons	1,479	1,515	1,542 [r]	1,523	1,560
Metal, smelter:						
Primary	do.	499	507	498	498	482
Zircon concentrates, gross weight	do.	549	762	605	388	798
INDUSTRIAL MINERALS						
Abrasives, natural, garnet		196,839	308,139 [r]	266,224 [r]	395,841 [r]	277,662
Barite		16,529 [r]	10,569 [r]	12,373 [r]	13,176 [r]	14,676
Cement, hydraulic[e]	thousand metric tons	8,300	8,600	8,500	8,400	9,000
Diamond:						
Gem	thousand carats	100	86	65	106	464
Industrial	do.	9,900	7,500	11,895	11,376	8,824
Total	do.	10,000	7,586	11,960	11,482	9,288
Feldspar, including nepheline syenite[e]		50,000	50,000	50,000	45,000	45,000
Gypsum	thousand metric tons	2,880 [r]	2,220 [r]	2,120 [r]	2,270 [r]	2,580
Lime[e]		2,200,000	2,200,000	2,200,000	2,100,000	1,950,000
Lithium, spodumene		295,000	421,391	456,921	421,000	425,000 [e]
Magnesite		275,000	640,000	587,000	450,000 [e]	450,000 [e]
Phosphate rock:[e]						
Gross weight[7]		2,600,000	2,650,000	2,800,000 [r]	2,500,000 [r]	2,800,000
P_2O_5 content		600,000	610,000	644,000 [r]	575,000 [r]	644,000
Rare earths, rare-earth oxide equivalent		--	2,188	3,222	3,000 [r]	8,000 [e]
Salt[7]	thousand metric tons	11,540 [r]	12,250 [r]	12,500 [r]	12,900 [r]	13,000
Soda ash[e]	do.	310	310	300	300	300
Stone and sand and gravel:[e]						
Construction sand	thousand metric tons	21,000	24,000	25,000	25,000	25,000
Crushed and broken stone	do.	100,000	100,000	100,000	100,000	100,000
Dimension stone	do.	120	140	140	140	140
Gravel	do.	6,000	8,000	8,000	8,000	8,000
Limestone	do.	19,000	22,000	21,000	20,000	20,000
Silica in the form of quartz, quartzite, glass sand	do.	3,100	3,500	3,500	3,000	3,000
Sulfur, byproduct:[e]	do.					
Metallurgy	do.	800	800	800	810 [r]	810
Petroleum	do.	60	60	60	90 [r]	90
Total	do.	860	860	860	900 [r]	900
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Mine output, bituminous and subbituminous	thousand metric tons	449,000	468,000	501,000 [r]	544,000 [r]	571,000
Salable:						
Bituminous and subbituminous	do.	356,000	348,000	380,000 [r]	412,000 [r]	442,000
Lignite[e]	do.	71,000	65,000	65,000	66,000	61,000
Total[e]	do.	427,000	413,000	445,000 [r]	478,000 [r]	503,000
Gas, natural, marketed	million cubic meters	51,868	51,253	60,610 [r]	61,199 [r]	64,897

See footnotes at end of table.

TABLE 1—Continued

AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2010	2011	2012	2013	2014
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum:						
Crude, includes condensate	thousand 42-gallon barrels	169,985	143,456	119,200	128,600	128,960
Refinery products	do.	235,971	239,618	234,734	219,370	209,070
Uranium, mine output, U_3O_8 content		7,440	6,942	6,968	7,584	5,883

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. -- Zero.

[1] Table includes data available through December 31, 2015.

[2] In addition to the commodities listed, bentonite, diatomite, jade, kyanite, opal, perlite, sapphire, and talc were produced, but available information was inadequate to make reliable estimates of output.

[3] Cobalt content of lateritic nickel ore and nickel concentrate reported by the government of Western Australia.

[4] Cobalt content of metal powder and oxide hydroxide reported by the Cobalt Development Institute, except as noted.

[5] Production reported by the Cobalt Development Institute and Glencore International AG.

[6] Does not include tin production from heavy mineral sand in Western Australia.

[7] Data include production from Christmas Island.

TABLE 2
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Aluminum:			
Bauxite	Gove open pit bauxite mine [Pacific Aluminium (Rio Tinto Ltd., 100%)]	15 km southeast of Nhulunbuy, NT	8,000
Do.	Huntly open pit bauxite mine [Alcoa of Australia Ltd. (Alcoa World Alumina and Chemicals, 100%)]	80 km south of Perth, WA	23,000
Do.	Weipa-Ely open pit bauxite mine [Comalco Ltd., operator (Rio Tinto Alcan, 100%)]	Weipa, QLD	26,000
Do.	Willowdale open pit bauxite mine [Alcoa of Australia Ltd. (Alcoa World Alumina and Chemicals, 100%)]	130 km south of Perth, WA	10,000
Do.	Boddington-Worsley open pit bauxite mine {Worsley Alumina Pty. Ltd., manager [South32, 86% (BHP Billiton Ltd., 100%); Japan Alumina Associates (Australia) Pty. Ltd., 10%; Sojitz Alumina Pty. Ltd., 4%]}	14 km south of Boddington, WA	19,000
Do.	Bald Hill Mine[3] (Australian Bauxite Ltd., 100%)	Campbell Town, TAS	900
Alumina, refinery	Queensland Alumina alumina refinery [Queensland Alumina Ltd., operator (Rio Tinto Ltd., 80%, and United Company RUSAL, 20%)]	Gladstone, QLD	3,950
Do.	Gove alumina refinery[4] (Rio Tinto Ltd., 100%)	Nhulunbuy, Gove, NT	2,650
Do.	Kwinana alumina refinery [Alcoa of Australia Ltd. (Alcoa World Alumina and Chemicals, 100%)]	Kwinana, WA	2,200
Do.	Pinjarra alumina refinery [Alcoa of Australia Ltd. (Alcoa World Alumina and Chemicals, 100%)]	Pinjarra, WA	4,200
Do.	Wagerup alumina refinery [Alcoa of Australia Ltd. (Alcoa World Alumina and Chemicals, 100%)]	East of Waroona, WA	2,600
Do.	Worsley alumina refinery {Worsley Alumina Pty. Ltd., manager [South32, 86% (BHP Billiton Ltd., 100%); Japan Alumina Associates (Australia) Pty. Ltd., 10%; Sojitz Alumina Pty. Ltd., 4%]}	20 km northwest of Collie, WA	4,600
Do.	Yarwun alumina refinery (Rio Tinto Ltd., 100%)	Gladstone, QLD	3,400
Metal, smelter	Bell Bay aluminum smelter [Pacific Aluminium (Rio Tinto Ltd., 100%)]	Bell Bay, TAS	192
Do.	Boyne Island aluminum smelter [Boyne Smelters Ltd., operator (Rio Tinto Alcan, 59.39%; YKK Aluminum, 9.5%; UACJ Australia, 9.43%; Southern Cross Aluminium, 7.57%; Ryowa Development, 5.27%; Ryowa Development II, 6.34%; Sumitomo Chemical Co. Ltd. 2.5%]	Boyne Island, QLD	571
Do.	Point Henry aluminum smelter[5] (Alcoa of Australia, 100%)	Point Henry, VIC	185
Do.	Portland aluminum smelter [Alcoa of Australia, manager, 55%; China International Trust Investment Co. (China state-owned company), 22.5%; Marubeni Australia Pty. Ltd., 22.5%]	Portland, VIC	345
Do.	Tomago aluminum smelter {Tomago Aluminium Co. Pty. Ltd., operator [Gove Aluminium Finance Ltd., 36.05%; Pacific Aluminium 51.55% (Rio Tinto Ltd., 100%); Hydro Aluminium, 12.40%]}	Tomago, NSW	561
Antimony	Costerfield underground antimony-gold mine [AGD Mining, operator (Mandalay Resources Ltd., 100%)]	50 km east and southeast of Bendigo, VIC	5
Do.	Hillgrove Mine4 (Bracken Resources Pty Ltd., 100%)	25 km east of Armidale, NSW	10
Bentonite	Arumpo open pit bentonite mine (Arumpo Bentonite Pty. Ltd., 100%)	95 km northeast of Mildura, NSW	30
Do.	Cedars open pit bentonite mine (PCP Douglass Pty. Ltd., 100%)	10 km southwest of Yarraman, QLD	20
Do.	Cressfield open pit bentonite mine (Sibelco Group through Sibelco Australia Ltd., 100%)	15 km north of Scone, NSW	12
Do.	Mantuan Downs (Pacific Enviromin Ltd., 100%)	West of Springsure, QLD	100
Do.	Miles open pit bentonite mine (Unimin Australia Ltd., 100%)	350 km west of Brisbane, QLD	100
Cement, plant	Adelaide Brighton Cement Pty Ltd., 100%	Angaston, SA	250
Do.	do.	Birkenhead, SA	1,200
Do.	do.	Geelong, VIC	800
Do.	do.	Munster, SA	590
Do.	Blue Circle Southern Cement Ltd. (Boral Ltd., 100%)	Berrima, NSW	1,200
Do.	do.	Maldon, NSW	700
Do.	do.	Waurn Ponds, VIC	250
Do.	Cement Australia Pty Ltd. (Hanson Ltd. and Holcim Australia Pty Ltd.)	Brisbane, QLD	1,200

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Cement, plant—Continued	Cement Australia Pty Ltd. (Hanson Ltd. and Holcim Australia Pty Ltd.)	Gladstone, QLD	1,700
Do.	do.	Railton, TAS	1,000
Do.	Cockburn Cement Ltd., 100%	Munster, 30 km south of Perth, WA	700
Chromite	Coobina open pit chromite mine[5] (Consolidated Minerals Ltd., 100%)	80 km southeast of Newman, WA	250
Coal	Airly coal mine (Banpu Public Co. Ltd. through Centennial Coal Co. Ltd., 100%)	42 km northwest of Lithgow, NSW	1,900
Do.	Angus Place longwall coal mine[6] (Centennial Coal Co. Ltd., 50%, and SK Kores Australia Pty Ltd., 50%)	16 km northwest of Lithgow, NSW	4,000
Do.	Appin longwall coal mine [Illawarra Coal Holdings Pty Ltd., operator (BHP Billiton Ltd., 100%)]	40 northwest of Wollongong, NSW	8,800
Do.	Ashton open pit and underground coal mine (Yancoal Australia Ltd., 90%, and Itochu Corp., 10%)	14 km northwest of Singleton, NSW	4,000
Do.	Austar underground coal mine [Yancoal Australia Ltd., 100% (Centennial Coal Co. Ltd., 100%)]	65 km west of Newcastle, NSW	2,000
Do.	Baal Bone coal mine [Oakbridge Pty. Ltd., 74.1% (Glencore plc, 100%); Sumitomo Corp., 5%; Toyota Tsusho Mining (Australia) Pty Ltd., 4.75%; private, 14.44%]	24 km northwest of Lithgow, NSW	2,500
Do.	Bengalla open pit coal mine (Rio Tinto Ltd., 32%)	5 km west of Muswellbrook, NSW	8,600
Do.	Blackwater open pit coal mine (includes South Blackwater) [BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)]	195 km west of Rockhampton, QLD	14,000
Do.	Broadmeadow open pit and underground coal mine [BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)]	30 km north of Moranbah, QLD	3,000
Do.	Bulga open pit coal mine [Oakbridge Pty Ltd., manager (Glencore plc, 68.25%; Nippon Steel Australia Pty. Ltd., 12.5%; Toyota Tsusho Mining (Australia) Pty Ltd., 4.38%; private, 13.3%)]	16 km southwest of Singleton, NSW	10,000
Do.	Burton open pit coal mine (Peabody Energy Corp., 95%, and Thiess Pty. Ltd., 5%)	150 km southwest of Mackay, QLD	5,800
Do.	Callide coal mine (Anglo Coal Pty Ltd., 100%)	120 km southwest of the Port of Gladstone, QLD	10,700
Do.	Caval Ridge open pit coal mine [BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)]	Central QLD	5,500
Do.	Carborough Downs underground coal mine (Vale SA, 90%)	Bowen basin, QLD	2,500
Do.	Charbon open pit and underground coal mine[7] (Banpu Public Co. Ltd. through Centennial Coal Co. Ltd., 95%, and SK Energy Australia Pty Ltd., 5%)	Western coalfields near Kandos, NSW	1,300
Do.	Clarence underground coal mine [Banpu Public Co. Ltd. through Centennial Coal Co., 85%, and SK Energy Australia Pty Ltd., 15%)	10 km east of Lithgow, NSW	2,600
Do.	Clermont coal mine [GS Coal Pty Ltd. (Glencore plc and Sumitomo Corp.)]	Central QLD	12,000
Do.	Commodore open pit coal mine {Roche Mining Pty. Ltd., operator [Intergen (Australia) Pty Ltd., 100%}	80 km southwest of Toowoomba, QLD	3,600
Do.	Coppabella open pit coal mine (Macarthur Coal Ltd., 73.3%, and others, 26.7%)	140 km southwest of Mackay, QLD	4,000
Do.	Cumnock No. 1 Colliery mine (Cumnock No. 1 Colliery Pty Ltd., 100%)	28 km northwest of Singleton, NSW	3,000
Do.	Curragh open pit coal mine (Wesfarmers Ltd., 100%)	70 km east of Emerald, QLD	9,000
Do.	Dartbrook coal mine[4] (Anglo Coal Holdings Australia Ltd., 77.3%)	70 km north of Singleton, NSW	3,750
Do.	Daunia open pit coal mine [BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)]	Central QLD	4,500
Do.	Dawson coal complex (includes Moura, Taroom, and Theodore) [Anglo American plc, 51%, and Mitsui & Co. (Australia) Ltd., 49%]	230 km west of Bundaberg, QLD	7,000
Do.	Dendrobium underground coal mine [Dendrobium Coal Pty Ltd., operator (BHP Billiton Ltd., 100%)]	15 km southwest of Wollongong, NSW	5,200

See footnotes at end of table.

TABLE 2—Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Coal—Continued	Donaldson open pit coal mine (Donaldson Coal Pty Ltd., 100%)	5 km southeast of Maitland, NSW	2,500
Do.	Drayton open pit coal mine [Anglo Coal Holdings Australia Ltd., 88.2%, manager; Mitsui Coal Development Australia Pty. Ltd., 3.8%; Mitsui Mining (Australia) Pty. Ltd., 3%; others, 5%]	35 km northwest of Singleton, NSW	5,000
Do.	Duralie open pit coal mine (Gloucester Coal Ltd., 100%)	110 km of Newcastle, NSW	2,000
Do.	Elouera underground coal mine (Gujarat NRE Resources NL, 100%)	15 km southwest of Wollongong, NSW	2,000
Do.	Ensham-Yongala open pit coal mine [Idemitsu Kosan Co. Ltd., 85%; J-Power (Australia) Pty. Ltd., 10%; LG International (Australia) Pty Ltd., 5%]	40 km northeast of Emerald, QLD	9,000
Do.	Ewington II open pit coal mine (Griffin Coal Mining Co. Pty. Ltd., 100%)	8 km east of Collie, WA	1,000
Do.	Foxleigh open pit coal mine (Foxleigh Mining Pty Ltd., 100%)	Bowen basin, QLD	3,600
Do.	German Creek and German Creek East open pit and underground coal mines [Anglo American plc, 70%, and Mitsui & Co. (Australia) Ltd., 30%]	275 km west-northwest of Rockhampton, QLD	6,000
Do.	Glennies Creek longwall coal mine (CVRD Inco Ltd., 85%; Nippon Steel Australia Pty Ltd., 5%; POSCO Australia Pty Ltd., 5%; private, 5%)	12 km north of Singleton, NSW	2,800
Do.	Goonyella-Riverside open pit coal mines (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)	140 km southwest of Mackay, QLD	16,000
Do.	Gregory Crinum open pit and underground coal mine [BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)]	60 km north of Emerald, QLD	5,500
Do.	Hunter Valley Operations (includes Carrington Chestnut, Howick, Hunter Valley No. 1, Lemington, Riverview open pit coal mines) (Rio Tinto Ltd., 80%)	10 km west and 25 km north of Singleton, NSW	15,000
Do.	Hail Creek open pit coal mine (Rio Tinto Ltd., 82%; Nippon Steel Australia Pty Ltd., 8%; Marubeni Coal Pty. Ltd., 6.66%)	100 km west of Mackay, QLD	8,000
Do.	Hazelwood open pit coal mine (International Power Hazelwood, 100%)	150 km southeast of Melbourne, VIC	20,000
Do.	Integra coal complex[4] (includes Camberwell and Glennies Creek [Vale SA, 61.2% (operator); Toyota Tsusho Corp.; 28%; JFE Holdings Inc., 3.6%; Nippon Steel & Sumitomo Metal Corp., 3.6%; POSCO, 3.6%]	10 km northwest of Singleton, NSW	4,000
Do.	Isaac Plains open pit coal mine[4] (Vale SA, 50%, and Sumitomo Corp., 50%)	7 km southeast of Moranbah, QLD	1,600
Do.	Jellinbah East open pit coal mine (Queensland Coal Mine Management Pty. Ltd., 70%; Marubeni Coal Pty. Ltd., 15%; Sojitz Australia Ltd., 15%)	90 km east of Emerald, QLD	4,000
Do.	Kestrel underground coal mine (Rio Tinto Ltd., 80%, and Mitsubishi Corp., 20%)	40 km north-northeast of Emerald, QLD	5,500
Do.	Liddell open pit coal mine (Xstrata Coal Australia Pty. Ltd., 67.5%, and Mitsui Matushima Australia Pty. Ltd., 32.5%)	25 km northwest of Singleton, NSW	4,000
Do.	Loy Yang open pit coal mine (Loy Yang Power Ltd., 100%)	165 km east of Melbourne, VIC	30,000
Do.	Mandalong underground coal mine (Centennial Coal Co. Ltd., 100%)	35 km southwest of Newcastle, NSW	4,500
Do.	Moorvale open pit coal mine (Macarthur Coal Ltd., 73.3%; CITIC Resources Australia Pty Ltd., 14%; Sojitz Australia Ltd., 7%; Nippon Steel Australia Pty Ltd., 2%)	10 km south of Coppabella, QLD	3,400
Do.	Moranbah North longwall coal mine (Anglo American plc., 88%, and Nippon Steel Australia Pty. Ltd., 5%)	150 km southwest of Mackay, QLD	5,800
Do.	Mount Arthur open pit coal mine (BHP Billiton Ltd., 100%)	5 km southwest of Muswellbrook, NSW	15,000
Do.	Mount Owen open pit coal mine (Glencore plc, 100%)	20 km northwest of Singleton, NSW	7,700
Do.	Mount Thorley open pit coal mine (Rio Tinto Ltd., 64%)	14 km southwest of Singleton, NSW	12,000
Do.	Muja open pit coal mine (The Griffin Coal Mining Co. Pty. Ltd., 100%)	18 km southeast of Collie, WA	2,000
Do.	Muswellbrook No. 2 open pit coal mine (Muswellbrook Coal Co., 100%)	4 km northeast of Muswellbrook, NSW	1,700
Do.	Myuna underground coal mine (Centennial Coal Co. Ltd., 100%)	35 km south of Newcastle, NSW	2,000
Do.	New Acland open pit coal mine (New Hope Corp. Ltd., 100%)	35 km northwest of Toowoomba, QLD	3,750

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Coal—Continued	Newlands-Collinsville-Abbot Point open pit coal mine (Glencore plc, 55%; Itochu Corp., 35%; Sumitomo Corp., 10%)	130 km west of Mackay, QLD	15,000
Do.	Newstan Colliery longwall coal mine[4] (Centennial Coal Co. Ltd., 100%)	30 km southwest of Newcastle, NSW	4,000
Do.	North Goonyella underground coal mine (Peabody Energy Corp., 100%)	40 km north Moranbah, QLD	3,000
Do.	Norwich Park open pit coal mine (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)	85 km north-northeast of Emerald, QLD	5,000
Do.	Oaky Creek longwall and Alliance open pit coal mines (Glencore plc, 55%; Sumitomo Coal Australia Pty. Ltd., 25%; Itochu Corp., 20%)	300 km west-northwest of Rockhampton, QLD	9,500
Do.	Peak Downs open pit coal mine (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	145 km north of Emerald, QLD	9,000
Do.	Poitrel open pit coal mine (BHP Billiton Ltd., 80%, and Mitsui & Co. (Australia) Ltd., 20%	Bowen basin, QLD	3,100
Do.	Premier open pit coal mine (Wesfarmers Premier Coal Ltd., 100%)	10 km southeast of Collie, WA	4,000
Do.	Ravensworth-Narama open pit coal mine (includes Ravensworth East Mine) (Xstrata Coal Australia Pty. Ltd., 100% of Ravensworth and 50% of Narama; and Iluka Resources Ltd., 50% of Narama)	20 km northwest of Singleton, NSW	3,500
Do.	Rixs Creek open pit coal mine (Bloomfield Colliers Pty. Ltd., 100%)	5 km northwest of Singleton, NSW	2,000
Do.	Rolleston open pit coal mine (Glencore plc, 75%; Itochu Corp., 12.5%; Sumitomo Corp., 12.5%)	90 km south-southeast of Emerald, QLD	8,000
Do.	Saraji open pit coal mine (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)	125 km north of Emerald, QLD	6,500
Do.	South Walker Creek open pit and underground coal mine [BHP Billiton Ltd., 80%, and Mitsui & Co. (Australia) Ltd., 20%]	90 km southwest of Mackay, QLD	5,300
Do.	Springvale underground coal mine (Banpu Public Co. Ltd. through Centennial Coal Co. Ltd., 50%, and SK Kores Australia Pty Ltd., 50%)	16 km northwest of Lithgow, NSW	4,500
Do.	Tahmoor longwall coal mine (includes Tahmoor North and Bargo Mines) [Austral Coal Ltd., operator (Glencore plc, 100%)]	70 km southwest of Sydney, NSW	2,500
Do.	Tarong-Meandu open pit coal mine (Rio Tinto Ltd., 100%)	85 km north of Toowoomba, QLD	7,000
Do.	Ulan underground coal mine (Glencore plc, 90%, and Mitsubishi Corp., 10%)	45 km northwest of Mudgee, NSW	5,000
Do.	United Collieries underground coal mine (Glencore plc, 95%, and private, 5%)	15 km west of Singleton, NSW	3,000
Do.	Wambo open pit and underground coal mine (Peabody Energy Corp., 100%)	30 km from Singleton, NSW	6,000
Do.	Warkworth coal mine (Rio Tinto Ltd., 44.46%)	15 km southwest of Singleton, NSW	1,300
Do.	West Cliff longwall coal mine (BHP Billiton Ltd., 100%)	43 km northwest of Wollongong, NSW	2,300
Do.	West Wallsend longwall coal mine (Glencore plc, 70%; Marubeni Coal Pty Ltd., 17%; private, 13%)	25 km southwest of Newcastle, NSW	2,500
Do.	Yallourn open pit lignite mine (CLP Power Asia Ltd., 100%)	140 km southeast of Melbourne, VIC	18,000
Cobalt:			
Mine	Cawse open pit nickel-cobalt mine (OJSC MMC Norilsk Nickel, 100%)	50 km northwest of Kalgoorlie, WA	0.2
Do.	Murrin Murrin open pit nickel-cobalt mine (Minara Resources Ltd., 60%, and Glencore plc, 40%)	60 km east of Leonora, WA	2.0
Do	Radio Hill underground nickel-cobalt mine (Fox Resources Ltd., 100%)	35 km south of Karratha, WA	0.2
Do	Ravensthorpe open pit mine (First Quantum Minerals Ltd., 100%)	155 km west of Esperance, WA	1.4
Refinery	Palmer nickel-cobalt refinery (Nickel Consolidated Pty Ltd., Nickel House Pty, and Nickel Process Pty)	Townsville, QLD	3
Copper:			
Mine, Cu content	Boddington open pit and underground gold mine (Newmont Mining Corp., 100%)	130 km southeast of Perth, WA	35
Do.	Cadia Valley open pit and underground gold-copper mine (includes Cadia East, Cadia Hill,[4] and Ridgeway Mines) (Newcrest Mining Ltd., 100%)	25 km south-southwest of Orange, NSW	90
Do.	Cobar underground copper mine (Glencore plc, 100%)	12 km northwest of Cobar, NSW	30
Do.	DeGrussa underground gold-copper mine (Sandfire Resources NL, 100%)	150 km north of Meekatharra, WA	300
Do.	Eloise underground copper mine (FMR Investments Pty Ltd., 100%)	60 km southeast of Cloncurry, QLD	70
Do.	Ernest Henry open pit and underground copper-gold mine (Glencore plc, 100%)	35 km northeast of Cloncurry, QLD	115

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Copper—Continued:				
Mine, Cu content—Continued		Golden Grove underground zinc-copper mine [MMG Ltd., operator (China Minmetals Group, 100%)]	225 km east of Geraldton, WA	20
Do.		Hellyer underground zinc-lead-copper-silver mine (Bass Metals Ltd., 100%)	80 km south-southwest of Burnie, TAS	1
Do.		Lady Annie copper (solvent extraction-electrowinning) mine (CST Mining Group Ltd., 100%)	100 km north-northwest of Mount Isa, QLD	19
Do.		Leichhardt copper mine (Cape Lambert Resources Ltd., 100%)	110 km northwest of Cloncurry, QLD[3]	10
Do.		Mount Gordon open pit copper (solvent extraction-electrowinning) mine (Aditya Birla Minerals Ltd., 100%)	120 km north of Mount Isa, QLD	50
Do.		Mount Isa underground copper-lead-zinc-silver mine (also Enterprise, George Fisher, and Hilton Mines) (Glencore plc, 100%)	Mount Isa, QLD	190
Do.		Mount Lyell underground copper-gold mine {Copper Mines of Tasmania Pty Ltd. [Sterlite Industries (India) Ltd., 100%]}	2 km northeast of Queenstown, TAS	35
Do.		Nifty open pit copper (solvent extraction-electrowinning) mine (Aditya Birla Minerals Ltd., 100%)	200 km southeast of Marble Bar, WA	25
Do.		Northparkes open pit and underground copper-gold mine (China Molybdenum Co. Ltd., 80%; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; SC Mineral Resources Pty. Ltd., 6.7%)	30 km northwest of Parkes, NSW	90
Do.		Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	235
Do.		Osborne underground copper-gold mine (Ivanhoe Australia Ltd., 100%)	120 km northeast of Boulia, QLD	22
Do.		Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance Mines) (New Gold Inc., 100%)	8 km south of Cobar, NSW	3
Do.		Prominent Hill open pit and underground copper-gold mine (OZ Minerals Ltd., 100%)	650 km northwest of Adelaide, SA	140
Do.		Rosebery underground zinc-lead-silver-copper-gold mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	35 km north of Queenstown, TAS	2
Do.		Tritton underground mine (Straits Resources Ltd., 100%)	Nyngan, NSW	30
Smelter		Mount Isa copper smelter (Glencore plc, 100%)	Mount Isa, QLD	250
Do.		Olympic Dam copper smelter [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	70
Refinery		Olympic Dam copper refinery [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	235
Do.		Townsville copper refinery (Glencore plc, 100%)	Townsville, QLD	300
Diamond	thousand carats	Argyle underground mine; previously open pit mine (Rio Tinto Ltd., 100%)	120 km southwest of Kununurra, WA	20,000
Do.	do.	Ellendale Mine (includes pipes 4 and 9) (Kimberley Diamond Ltd., 100%)	130 east southeast of Derby, WA	700
Do.	do.	Ellendale 9 North Mine[5] (Blina Diamond NL, 100%)	140 east of Derby, WA	500
Diatomite		Barraba open pit diatomite mine (Australia Diatomite Mining Pty. Ltd., 100%)	85 km north-northwest of Tamworth, NSW	25
Do.		Mount Sylvia Diatomite Pty Ltd.	Mount Sylvia Mine, 35 km southeast of Toowoomba, QLD	NA
Do.		Greenvale Silicon Pty Ltd.	Conjuboy Mine, 45 km northwest of Greenvale, QLD	NA
Dolomite		Ardrossan metallurgical dolomite quarry (OneSteel Ltd., 100%)	Northern York Peninsula, SA	650
Do.		Cookes Hill Mine (includes Nickol River and Warrawoona Mines) (Haoma Mining NL, 100%)	Near Port Hedland, WA	400
Feldspar		Broken Hill open pit feldspar mine (includes Bakers, Lady Beryl, and Spar Ridge Mines) (Unimin Australia Ltd., 100%)	42 km southwest of Broken Hill, NSW	15

See footnotes at end of table.

TABLE 2—Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Garnet		Port Gregory open pit industrial garnet mine (GMA Garnet Pty. Ltd., 100%)	100 km north of Geraldton, WA	400
Gas:				
Condensate	thousand 42-gallon barrels per day	North West Shelf gas operations {Woodside Petroleum Pty. Ltd., manager [BHP Petroleum Pty. Ltd., BP Australia Holdings Ltd., Chevron Asiatic Ltd., Japan Australia LNG (MIMI) Pty. Ltd., Shell Development (Australia) Pty. Ltd., and Woodside Petroleum Ltd., 16.67% each]}	130 km offshore Dampier, WA	60
Natural	million cubic meters per day	do.	do.	20
Liquefied natural	million metric tons	do.	Four-train liquefaction plant, Burrup Peninsula, WA	12
Gold:				
Mine	kilograms	Agnew open pit and underground gold mine (Gold Fields Ltd., 100%)	23 km west of Leinster, WA	5,600
Do.	do.	Boddington open pit and underground gold mine (Newmont Mining Corp., 100%)	130 km southeast of Perth, WA	31,000
Do.	do.	Bronzewing underground gold mine (includes Mount McClure, Venus, Success, Cockburn, Corboys, and Mount Joel Mines) (Audax Resources Ltd., 100%)	65 km northeast of Leinster, WA	9,000
Do.	do.	Burnside open pit mines (includes Union Reefs, Brocks Creek, North Point, Princess Louise, Rising Tide, Zapopan, and Fountain Head Mines) (Crocodile Gold Corp., 100%)	Pine Creek, NT	6,500
Do.	do.	Cadia Valley open pit and underground gold-copper mine (includes Cadia East, Cadia Hill, and Ridgeway Mines) (Newcrest Mining Ltd., 100%)	25 km south-southwest of Orange, NSW	25,000
Do.	do.	Doolgunna open pit and underground gold-copper mine (includes DeGrussa Mine) (Sandfire Resources NL, 100%)	140 km north of Meekatharra, WA	270
Do.	do.	Ernest Henry open pit copper-gold mine (Glencore plc, 100%)	35 km northeast of Cloncurry, QLD	3,000
Do.	do.	Garden Well gold mine (Regis Resources Ltd., 100%)	350 kilometres northeast of Kalgoorlie, WA	5,200
Do.	do.	Granny Smith open pit gold mine (includes Wallaby Mine) (Barrick Gold Corp., 100%)	20 km south of Laverton, WA	16,000
Do.	do.	Gwalia underground gold mine (St Barbara Ltd., 100%)	3 km south of Leonora, WA	2,600
Do.	do.	Henty underground gold-silver mine (Unity Mining Ltd., 100%)	30 km north of Queenstown, TAS	3,700
Do.	do.	Hillgrove Mine (Straits Resources Ltd., 100%)	25 km east of Armidale, NSW	650
Do.	do.	Jundee-Nimary open pit and underground gold mine (Newmont Mining Corp., 100%)	45 km northeast of Wiluna, WA	12,000
Do.	do.	Kalgoorlie open pit and underground gold mine [Kalgoorlie Consolidated Gold Mine Pty Ltd., operator (Barrick Gold Australia, 50%, and Newmont Mining Corp., 50%)]	Southeast corner of the Kalgoorlie Boulder Township, WA	25,000
Do.	do.	Kanowna Belle underground gold mine (Barrick Gold Corp., 100%)	18 km northeast of Kalgoorlie, WA	7,000
Do.	do.	Lawlers underground gold mine (Barrick Gold Corp., 100%)	30 km southwest of Leinster, WA	3,000
Do.	do.	Moolart Well gold mine (Regis Resources Ltd., 100%)	100 km north of Laverton, WA	3,000
Do.	do.	Mount Lyell underground copper-gold mine [Sterlite Industries (India) Ltd., 100%]	2 km northeast of Queenstown, TAS	1,000
Do.	do.	Mount Magnet open pit and underground gold mine (includes Hill 50 and Star Mines) (Ramelins Resources Ltd., 100%)	2 km from Mount Magnet, WA	8,500
Do.	do.	Norseman underground gold mine[4] (Norseman Gold Plc, 100%)	Norseman, WA	3,700
Do.	do.	Northparkes open pit and underground copper-gold mine (China Molybdenum Co. Ltd., 80%, and Sumitomo Metal Mining Oceania Pty. Ltd., 20%)	30 km north of Parkes, NSW	1,550
Do.	do.	Osborne underground copper-gold mine (Ivanhoe Australia Ltd., 100%)	120 km northeast of Boulia, QLD	1,000
Do.	do.	Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	1,500
Do.	do.	Paddington open pit and underground gold operation (Noron Gold Fields Ltd., operator) (Zijin Mining Group Co. Ltd., 89%)	35 km north of Kalgoorlie, WA	5,000
Do.	do.	Pajingo underground gold mine (includes Vera-Nancy Mine) (Evolution Mining Ltd., 100%)	60 km south-southeast of Charters Towers, QLD	6,400

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Gold—Continued				
Mine—Continued	kilograms	Plutonic open pit and underground gold mine (Barrick Gold Corp., 100%)	180 km northeast of Meekatharra, WA	8,000
Do.	do.	Prominent Hill open pit copper-gold mine (OZ Minerals Ltd., 100%)	650 km northwest of Adelaide, SA	2,200
Do.	do.	Ravenswood open pit mine (includes Nolans, Sarsfield, and Mount Wright Mines) (Resolute Mining Ltd., 100%)	100 km south of Townsville, QLD	3,000
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	35 km north of Queenstown, TAS	1,000
Do.	do.	Saint Ives open pit and underground gold mine (Gold Fields Ltd., 100%)	75 km south-southeast of Kalgoorlie, WA	15,000
Do.	do.	Selwyn underground copper-gold mine (Barrick Gold Corp., 100%)	160 km southeast of Mount Isa, QLD	700
Do.	do.	Stawell underground gold mine (Perseverance Corp. Ltd., 100%)	250 km west of Melbourne, VIC	3,000
Do.	do.	Sunrise Dam open pit mine gold (includes Cleo Mine) (AngloGold Ashanti Ltd., 100%)	55 km south of Laverton, WA	15,000
Do.	do.	Tanami open pit gold mine (includes Central Desert Joint Venture) (Newmont Gold Corp., 100%)	650 km northwest of Alice Springs, NT	15,000
Do.	do.	Telfer copper and gold mine (Newcrest Mining Ltd., 100%)	400 km east southeast of Port Hedland, WA	15,000
Do.	do.	Trident gold mine (Alacer Gold Corp., 100%)	Higginsville, WA	5,000
Do.	do.	Tropicana gold mine (AngloGold Ashanti Australia Pty Ltd., 70% and Independence Group NL 30%)	330 km northeast of Kalgoorlie, WA	16,400
Do.	do.	Wattle Dam gold mine[3] (Tychean Resources Ltd., 100%)	70 km south of Kalgoorlie, WA	3,000
Do.	do.	Wiluna open pit and underground gold mine (Apex Minerals NL, 100%)	7 km south of Wiluna, WA	3,300
Smelter	do.	Gidji Roaster gold smelter (Kalgoorlie Consolidated Gold Mines Pty. Ltd., 100%)	Kalgoorlie, WA	24,300
Refinery	do.	Perth Mint Refinery [Gold Corp. (Government of Western Australia, 100%)]	Newburn, WA	400,000
Gypsum		Gypsum Resources Australia Pty. Ltd., 100%	Lake MacDonnell open pit gypsum mine, near Point Thevenard, SA	1,400
Do.		Dredging of gypsum from surface of Lake MacLeod (Rio Tinto Ltd., 68.4%)	Lake MacLeod, WA	900
Iron and steel:				
Iron ore		Channar open pit iron ore mine [Hamersley Iron Pty. Ltd., 60% (Rio Tinto Ltd., 100%), and China Iron and Steel Industry & Trade Group Corp. (SINOSTEEL) (a China state-owned company), 40%]	70 km south of Tom Price, WA	11,000
Do.		Cloudbreak iron ore mine (includes Chichester Range, Christmas Creek, WhiteKnight, Mount Lewin, Mount Nicholas, and Flinders Mines) (Fortescue Metals Group Ltd., 100%)	Chichester Ranges, East Pilbara, WA	55,000
Do.		Cockatoo Island open pit iron ore mine (BHP Billiton Ltd., 100%)	130 km north northeast of Derby, WA	1,500
		Eastern Range open pit iron ore mine [Hamersley Iron Pty. Ltd., 54% (Rio Tinto Ltd., 100%), and Shanghai Baosteel Group Corp., 46%]	10 km east of Paraburdoo, WA	10,000
Do.		Extension Hill open pit iron ore mine (Mount Gibson Iron Ltd., 100%)	85 km of Perenjori, WA	3,000
Do.		Hamersley Operations (includes Brockman 2, Brockman 4, Marandoo, Mount Tom Price, Nammuldi, Paraburdoo, Western Turner Syncline, and Yandicoogina open pit iron ore mines), Rio Tinto Ltd., 100%	30 km to 85 km northeast, northwest, and south of Tom Price, WA	140,000
Do.		Hope Downs 1 Mine [Hope Downs Iron Ore Pty Ltd. (Hancock Prospecting Pty Ltd. 100%), 50%, and Rio Tinto Ltd., 50%]	75 km northwest of Newman, Pilbara region, WA	30,000
Do.		Hope Downs 4 Mine [Hope Downs Iron Ore Pty Ltd. (Hancock Prospecting Pty Ltd. 100%), 50%, and Rio Tinto Ltd., 50%]	Pilbara region, WA	15,000
Do.		Jimblebar open pit iron ore mine (includes ore from Wheelarra JV) {BHP Iron Ore (Jimblebar) Pty Ltd., 85% [BHP Billiton Ltd., 100%]; ITOCHU Minerals and Energy of Australia, 8%; Mitsui Iron Ore Corp., 7%}	40 km east of Newman, WA	20,000

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Iron and steel—Continued:			
Iron ore—Continued	JW4 open pit (ore blended with that of Yandi Mine) (BHP Billiton Ltd., 68%; JFE Steel Australia 20%; ITOCHU Minerals and Energy of Australia, 6.4%; Mitsui Iron Ore Corp., 5.6%)	Pilbara region, WA	NA
Do.	Karara open pit iron ore mine (Anshan Iron and Steel Group Corp., 50%, and Gindalbie Metals Ltd., 50%)	110 km south of Yalgoo, WA	8,000
Do.	Koolan Island open pit iron ore mine (Mount Gibson Iron Ltd., 100%)	140 north of Derby, WA	4,000
Do.	Koolyanobbing Central open pit iron ore mine (Portman Ltd., 100%)	50 km north-northeast of Southern Cross, WA	6,000
Do.	Mount Goldsworthy mining associates joint venture (includes the Area C, the Nimingarra, and the Yarrie[5] Mines) [BHP Billiton Minerals Pty Ltd. (manager), 85%; ITOCHU Minerals & Energy of Australia Pty Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%]	180 km east of Port Hedland, Pilbara region, WA	42,000
Do.	Mount Gould open pit iron ore mine (Unimin Australia Ltd., 100%)	160 km west of Meekatharra, WA	6,000
Do.	Mount Newman open pit iron ore mine (includes Mount Whaleback orebodies 18, 24, 25, 29, 30 and 35) {BHP Billiton Minerals Pty Ltd., 85%, [BHP Billiton Ltd., 100%]; Mitsui ITOCHU Iron Pty Ltd., 10% [Mitsui & Co. (Australia) Ltd., 100%]; ITOCHU Minerals and Energy of Australia, 5% [ITOCHU Corp., 100%]}	Within 13 km of Newman, Pilbara region, WA	42,000
Do.	Pannawonica (includes Mesa A and J) open pit iron ore mine [Robe River Iron Associates, manager (Rio Tinto Ltd., 53%; Mitsui & Co. (Australia) Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; Sumitomo Metal Australia Pty. Ltd., 3.5%]	130 km south-southwest of Dampier, Pilbara region, WA	35,000
Do.	Sino Iron iron ore mine (CITIC Pacific Mining Management Pty Ltd., 80% and China Metallurgical Group Corp., 20%)	Cape Preston, 100 km southwest of Karratha, Pilbara region, WA	2,000
Do.	Savage River open pit iron ore mine (Grange Resources Ltd., 100%)	100 km southwest of Burnie, TAS	2,400
Do.	Tallering Peak open pit iron ore mine (Mount Gibson Iron Ltd., 100%)	120 northeast of Geraldton, WA	3,000
Do.	West Angelas open pit iron ore mine [Robe River Iron Associates, manager (Rio Tinto Ltd., 53%; Mitsui & Co. (Australia) Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; Sumitomo Metal Australia Pty. Ltd., 3.5%]	110 km west of Newman, Pilbara region, WA	29,400
Do.	Whyalla open pit iron ore mines (Arrium Steel Ltd., 100%)	270 km northwest of Adelaide, SA	2,600
Do.	Yandi open pit iron ore mine (includes ore from JW4 open pit) [BHP Billiton Minerals Pty Ltd. (BHP Billiton Ltd., 100%), manager, 85%; ITOCHU Minerals & Energy of Australia Pty Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%]	92 km north of Newman, Pilbara region, WA	47,000
Pig iron	Hismelt pig iron plant [Hismelt Corp. Pty Ltd. (Rio Tinto Ltd., 60%; Nucor Corp., 25%; Mitsubishi Corp., 10%; Shougang Corp., 5%)]	Kwinana, WA	800
Steel	Laverton Steel Mill (Arrium Steel Ltd., 100%)	Laverton, Melbourne, VIC	700
Do.	Port Kembla steelworks (Blue Scope Steel Ltd., 100%)	Port Kembla, NSW	2,600
Do.	Smorgon Steel Group Ltd.	Laverton, Melbourne, VIC	700
Do.	do.	Waratch, NSW	285
Do.	Sydney Steel Mill (Arrium Steel Ltd., 100%)	Sydney, NSW	600
Do.	Whyalla steelworks (Arrium Steel Ltd., 100%)	Whyalla, SA	1,200
Kaolin	Axedale Clays open pit kaolin mine (E Clay Pty Ltd., 100%)	18 km east of Bendigo, VIC	50
Do.	Pittong open pit kaolin mine (Imerys Minerals Australia Pty Ltd., 100%)	35 km southwest of Ballarat, VIC	110
Do.	Skardon River open pit kaolin mine (Queensland Kaolin Pty. Ltd., 96.6%, and private, 3.4%)	85 km north of Weipa, QLD	150
Lead:			
Mine, Pb content	Angas zinc mine (Terramin Australia Ltd., 100%)	2 km from Strathalbyn, SA	10
Do.	Broken Hill underground silver-zinc-lead mine (Shenzhen Zhongjin Lingnan Nonfemet Co. Ltd., 50.1%, and Perilya Ltd., 49.9%)	Broken Hill, NSW	90

See footnotes at end of table.

TABLE 2—Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Lead—Continued:			
Mine, Pb content—Continued	Cannington underground silver-lead-zinc mine (BHP Billiton Ltd., 100%)	85 km southwest of McKinlay, QLD	265
Do.	Century open pit zinc-silver-lead mine (MMG Ltd., 100%)	250 km north of Mount Isa, QLD	90
Do.	Endeavor underground zinc-silver-lead mine (CBH Resources Ltd., 100%)	40 km northwest of Cobar, NSW	45
Do.	Hellyer underground zinc-lead-copper-silver mine[4] (Bass Metals Ltd., 100%)	80 km south-southwest of Burnie, TAS	44
Do.	Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton Mines) (Glencore plc, 100%)	Mount Isa, QLD	150
Do.	Rosebery underground zinc-lead-silver-copper-gold mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	5 km north of Queenstown, TAS	25
Smelter	Mount Isa smelter (Glencore plc, 100%)	Mount Isa, QLD	240
Do.	Port Pirie smelter (Nyrstar Corp., 100%)	5 km north of Queenstown, TAS	235
Lithium, spodumene	Greenbushes open pit and underground tantalite-spodumene mine {Windfield Holding Pty Ltd., operator [Chengdu Tianqi Industry (Group) Co. Ltd., 100%]}	70 km southeast of Bunbury, WA	740
Do.	Mount Cattlin spodumene mine[4] (Galaxy Resources Ltd., 100%)	2 km north of Ravensthorpe, WA	140
Magnesite	Kunwarara open pit magnesite mine (includes Marlborough Mine) [Queensland Magnesia Pty Ltd., operator (Sibelco Group, 100%)]	70 km northwest of Rockhampton, QLD	3,000
Do.	Salt Creek open pit mine (Agricola Mining Pty Ltd., 100%)	70 km southeast of Meningie, SA	NA
Do.	Thuddungra Mine (Orind Australia Pty Ltd., 100%)	38 km northwest of Young, NSW	80
Manganese:			
Mine, concentrate	Bootu Creek open pit manganese mine (OM Holding Ltd., 100%)	110 km north of Tennant Creek, NT	600
Do.	Groote Eylandt open pit manganese mine [Groote Eylandt Mining Co., operator (BHP Billiton Ltd., 60%, and Anglo American Corp., 40%)]	Groote Eylandt, NT	3,100
Do.	Woodie Woodie open pit manganese mine (includes Bells and East Pilbara leases) [Pilbara Manganese Pty Ltd., operator (Consolidated Minerals Ltd., 100%)]	400 km southeast of Port Hedland, WA	1,000
Alloys	Bell Bay Smelter [Tasmanian Electro Metallurgical Co. Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Bell Bay, TAS	250
Nickel:			
Mine, Ni content	Avebury nickel mine (includes Bison, North Avebury, Saxon, and West Viking Mines) [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	Near Zeehan, TAS	7
Do.	Black Swan underground nickel mine[4] (includes Silver Swan Mine) (OJSC MMC Norilsk Nickel, 100%)	53 km northeast of Kalgoorlie, WA	10
Do.	Carnilya Hill open pit mine (Mincor Resources NL, 70%, and View Resources Ltd., 30%)	25 km northeast of Kambalda, WA	5
Do.	Cawse open pit nickel-cobalt mine[4] (OJSC MMC Norilsk Nickel, 100%)	50 km northeast of Kalgoorlie, WA	9
Do.	Cosmos open pit nickel mine[4] (Glencore plc, 100%)	50 km north of Leinster, WA	13
Do.	Flying Fox underground mine (Western Areas NL, 100%)	108 km south of Marvel Loch, WA	15
Do.	Kambalda underground nickel mines (Palmary Enterprises Ltd., 100%)	5 km south of Kambalda, WA	35
Do.	Lake Johnston underground nickel mine[4] (includes Maggie Hays, Maggie Hays Lake, and Emily Ann Mines) (OJSC MMC Norilsk Nickel, 100%)	130 km west of Norseman, WA	12
Do.	Lanfranchi underground mine (includes Deacon, Schmitz, Tramway, and Winner Mines) (Panoramic Resources Ltd., 100%)	42 km south of Kambalda, WA	10

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Nickel—Continued:				
Mine, Ni content—Continued		Leinster open pit and underground nickel mines[5] (BHP Billiton Ltd., 100%)	10 km north of Leinster, WA	44
Do.		Long underground mine (Independence Group NL, 100%)	Near Kambalda East, WA	10
Do.		Miitel underground nickel mine (includes Redross and Mariners Mines) (Mincor Resources NL, 100%)	70 km south of Kambalda, WA	10
Do.		Mount Keith open pit nickel mine includes (Cliffs, Jericho, Venus, and Yakabindie Mines) (BHP Billiton Ltd., 100%)	70 km south-southeast of Wiluna, WA	40
Do.		Murrin Murrin open pit nickel-cobalt mine (Minara Resources Ltd., 60%, and Glencore plc, 40%)	60 km east of Leonora, WA	34
Do.		Radio Hill underground nickel-cobalt mine (Fox Resources Ltd., 100%)	35 km south of Karratha, WA	4
Do.		Ravensthorpe open pit mine[4] (First Quantum Minerals Ltd., 100%)	155 km west of Esperance, WA	39
Do.		Savannah underground mine (Panoramic Resources Ltd., 100%)	120 km north of Halls Creek, WA	8
Do.		Spotted Quoll nickel mine (includes Tim King and Willy Willy Mines) (Western Areas NL, 100%)	114 km south of Marvel Loch, WA	10
Do.		Waterloo underground nickel mine (includes Amorac Mine) (OJSC MMC Norilsk Nickel, 100%)	90 km north of Leonora, WA	5
Smelter		Kalgoorlie nickel smelter (BHP Billiton Ltd., 100%)	Kalgoorlie, WA	100
Refinery		Kwinana nickel refinery (BHP Billiton Ltd., 100%)	Kwinana, WA	67
Do.		Murrin Murrin nickel refinery (Minara Resources Ltd., 60%, and Glencore plc, 40%)	Murrin Murrin, WA	45
Do.		Yabulu nickel-cobalt refinery (Nickel Consolidated Pty Ltd., Nickel House Pty Ltd., and Nickel Process Pty Ltd.)	Townsville, QLD	40
Opal		Many small producers	Andamooka and Coober Pedy areas, SA; Lightning Ridge area, NSW	NA
Petroleum	thousand 42-gallon barrels per day	Exxon Mobil Corp., 100%	Altona Refinery, VIC	120
Do.	do.	Bulwer Island Refinery [BP Amoco Refinery (Bulwer Island) Pty. Ltd., 100%]	Bulwer Island, QLD	69.3
Do.	do.	Geelong Refinery [Shell Refining (Australia) Pty. Ltd., 100%]	Geelong, VIC	110
Do.	do.	Kurnell Refinery (Caltex Australia Ltd., 100%)	Kurnell, NSW	114
Do.	do.	Kwinana Refinery [BP Amoco Refinery (Kwinana) Pty. Ltd., 100%]	Kwinana, WA	138
Do.	do.	Lytton Refinery (Caltex Australia Ltd., 100%)	Lytton, QLD	106
Phosphate rock		Phosphate Hill-Duchess open pit phosphate mine (Incitec Pivot Ltd., 100%)	140 km northwest of Mount Isa, QLD	2,200
Rare earths, rare-earth oxide equivalent	metric tons	Mount Weld Mine (Lynas Corp. Ltd.)	Mount Weld, WA	8,000
Salt		Dampier Salt, solar evaporation salt pans (Rio Tinto Ltd., 68.4%)	Near Dampier, WA	4,200
Do.		Lake MacLeod solar salt and gypsum evaporation pans (Rio Tinto Ltd., 68.4%)	65 km north of Carnarvon, WA	2,900
Do.		Port Hedland solar salt fields (Rio Tinto Ltd., 68.4%)	Port Hedland, WA	3,200
Silica		Itochu Corp., 50%, and Tochu Corp., 50%	Kemerton silica sands dredge, 25 km northeast of Bunbury, WA	450
Silver:				
Mine, Ag content	kilograms	Broken Hill underground silver-zinc-lead mine (Shenzhen Zhongjin Lingnan Nonfemet Co. Ltd., 50.1%, and Perilya Ltd., 49.9%)	Broken Hill, NSW	81,200
Do.	do.	Cannington underground silver-lead-zinc mine (BHP Billiton Ltd., 100%)	85 km southwest of McKinlay, QLD	700,000
Do.	do.	Century open pit zinc-silver-lead mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	250 km north of Mount Isa, QLD	3,000

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Silver—Continued:				
Mine, Ag content—Continued	kilograms	Pasminco Ltd., 100%	Cockle Creek silver smelter, NSW	85,000
Do.	do.	Endeavor underground zinc-silver-lead mine (CBH Resources Ltd., 100%)	40 km northwest of Cobar, NSW	35,000
Do.	do.	Hellyer underground zinc-lead-copper-silver mine (Intec Ltd., 50%, and Polymetals Mining Services Pty Ltd., 50%)	80 km south-southwest of Burnie, TAS	60,000
Do.	do.	Henty underground gold-silver mine (Barrick Gold Ltd., 100%)	30 km north of Queenstown, TAS	1,100
Do.	do.	Mount Isa underground copper-lead-zinc-silver mine (also Enterprise, George Fisher, and Hilton Mines) (Glencore plc, 100%)	Mount Isa, QLD	375,000
Do.	do.	Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	27,000
Do.	do.	Peak underground gold-zinc-lead-copper-silver mine (includes New Cobar, New Occidental, and Perseverance Mines), (GoldCorp Inc., 100%)	8 km south of Cobar, NSW	6,000
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	5 km north of Queenstown, TAS	35,000
Smelter	do.	Port Pirie smelter (Nyrstar Corp., 100%)	do.	450,000
Refinery	do.	Perth refinery [AGR Management Services Ltd. (Australian Gold Alliance Pty Ltd., 40%; Western Australian Mint, 40%; and Johnson Matthey (Australian) Ltd., 20%]	Newburn, WA	NA
Talc		Three Springs open pit talc mine (Imerys SA, 100%)	330 km north of Perth, WA	150
Tantalum, tantalite, Ta_2O_5 content	metric tons	Greenbushes open pit and underground tantalite-spodumene mine[3] (Global Advanced Metals Ltd., 100%)	70 km southeast of Bunbury, WA	NA
Do.	do.	Bald Hill tantalite mine[4] (Haddington Resources Ltd., 100%)	60 km southeast of Kambalda, WA	NA
Do.	do.	Wodgina open pit tantalite mine[4] (Global Advanced Metals Ltd., 100%)	70 km southeast of Bunbury, WA	NA
Tin:				
Mine, Sn content	do.	Collingwood underground tin mine[4] (Metals X Ltd., 100%)	35 km south of Cooktown, QLD	3,000
Do.	do.	Greenbushes open pit and underground tantalite-spodumene mine[4] (Global Advanced Metals Ltd., 100%)	70 km southeast of Bunbury, WA	1,000
Do.	do.	Mount Bischoff open pit mine[4] (Metals X Ltd., 50%; L'sea Resources International Holdings Ltd. and YT Parksong Australia Holdings Pty Ltd., 50%)	55 km southwest of Burnie, TAS	6,000
Do.	do.	Renison Bell underground tin mine (Metals X Ltd., 50%; L'sea Resources International Holdings Ltd. and YT Parksong Australia Holdings Pty Ltd., 50%)	136 km south of Burnie, TAS	4,000
Smelter	do.	Greenbushes smelter[4] (Global Advanced Metals Ltd., 100%)	70 km southeast of Bunbury, WA	1,000
Titanium, mineral sands		Broken Hill region mines (Cristal Australia Pty Ltd., 100%)	120 km north of Mildura, NSW	NA
Do.		Murray Basin heavy-mineral sands mine (Iluka Resources Ltd., 100%)	80 km southeast of Mildura, VIC	NA
Do.		Perth Basin heavy-mineral sands mine (Iluka Resources Ltd., 100%)	260 km north of Perth, WA	NA
Do.		North Capel open pit heavy-mineral sands mine (Iluka Resources Ltd., 100%)	7 km north of Capel, WA	NA
Do.		North Stradbroke Island heavy-mineral sands dredge (Stradbroke Rutile Pty. Ltd., 100%)	35 km east of Brisbane, QLD	NA
Do.		Tiwest Joint Venture heavy-mineral sands dredge (Exxaro Resources Ltd., 50%, and Tronox Inc., 50%)	180 km north of Perth, WA	NA
Tungsten, W content	metric tons	Kara magnetite and scheelite mine (Tasmania Mines Ltd., 100%)	30 km south of Burnie, TAS	50
Do.	do.	Mount Carbine tungsten mine (Carbine Tungsten Ltd., 100%)	75 km west of Cairns, QLD	4,000
Do.	do.	Wolfram Camp molybdenum-tungsten mine (Almonty Industries Inc., 100%)	85 km west of Cairns, QLD	500
Uranium, U_3O_8 content	do.	Beverley in situ leach uranium operation (Heathgate Resources Pty. Ltd., 100%)	300 km northeast of Port Augusta, SA	1,000
Do.	do.	Honeymoon uranium mine (UraniumOne Inc., 100%)	75 km northwest of Broken Hill, SA	400

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Uranium, U_3O_8 content—Continued	metric tons	Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	4,400
Do.	do.	Ranger open pit uranium mine (Energy Resources of Australia Ltd., 100%)	230 km east of Darwin, NT	5,000
Vanadium, V_2O_5 content	do.	Windimurra open pit mine vanadium[4] (Precious Metals Australia Ltd., 90%, and Noble Group Ltd., 10%)	100 km east-southeast of Mount Magnet, WA	8
Zinc:				
Mine, Zn content		Angas zinc mine (Terramin Australia Ltd., 100%)	2 km from Strathalbyn, SA	24
Do.		Broken Hill underground silver-zinc-lead mine (Shenzhen Zhongjin Lingnan Nonfemet Co. Ltd., 50.1%, and Perilya Ltd., 49.9%)	Broken Hill, NSW	360
Do.		Cannington underground silver-lead-zinc mine (BHP Billiton Ltd., 100%)	85 km southwest of McKinlay, QLD	100
Do.		Century open pit zinc-silver-lead mine [MMG Ltd., operator (China Minmetals Group, 100%)]	250 km north of Mount Isa, QLD	500
Do.		Endeavor underground zinc-silver-lead mine (CBH Resources Ltd., a subsidiary of Toho Zinc Co. Ltd. of Japan, 100%)	40 km northwest of Cobar, NSW	125
Do.		Golden Grove underground zinc-copper mine [MMG Ltd., operator (China Minmetals Group, 100%)]	225 km east of Geraldton, WA	150
Do.		Hellyer underground zinc-lead-copper-silver mine[4] (Intec Ltd., 50%, and Polymetals Mining Services Pty Ltd., 50%)	80 km south-southwest of Burnie, TAS	130
Do.		Jaguar underground mine (Jabiru Metals Ltd., 100%)	250 km north of Kalgoorlie, WA	420
Do.		McArthur River open pit mine [McArthur River Mining Pty Ltd., operator (Glencore plc, 100%)]	60 km southwest of Borroloola, NT	143
Do.		Mount Isa underground copper-lead-zinc-silver mine (also Enterprise, George Fisher, Hilton Mines, and Lady Loretta) (Glencore plc, 100%)	Mount Isa, QLD	175
Do.		Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance Mines) (New Gold Inc., 100%)	8 km south of Cobar, NSW	8
Do.		Rosebery underground zinc-lead-silver-copper-gold mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	35 km north of Queenstown, TAS	100
Smelter		Port Pirie smelter (Nyrstar NV, 100%)	5 km north of Queenstown, TAS	45
Do.		Hobart smelter (Nyrstar NV, 100%)	Hobart, TAS	320
Refinery		Sun Metals zinc refinery [Sun Metals Corp. Pty. Ltd., operator (Korea Zinc Co., 100%)]	Townsville, QLD	170

[e] Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

[1] Abbreviations used for States and Territories in this table include the following: NSW—New South Wales; NT—Northern Territory; QLD—Queensland; SA—South Australia; TAS—Tasmania; VIC—Victoria; WA—Western Australia.

[2] Abbreviation(s) used for unit(s) of measure in this table include the following: km—kilometer.

[3] Commissioned December 9, 2014.

[4] On care-and-maintenance status.

[5] Closed.

[6] Company announcement in October 2014 indicated that the mine would be placed on care and maintenance in April 2015.

[7] Near depletion; underground mining operations ceased in April 2014, and open pit operations were expected to cease in 2015.

TABLE 3
AUSTRALIA: RESERVES OF MAJOR MINERAL COMMODITIES IN 2014

Commodity		Reserves[1, 2]
Antimony, Sb content	thousand metric tons	139
Bauxite	million metric tons	6,200
Coal:		
Black, recoverable	billion metric tons	56
Brown, recoverable	do.	34
Cobalt, Co content	thousand metric tons	1,070
Copper, Cu content	million metric tons	88
Diamond	million carats	220
Gold, Au content	metric tons	9,080
Iron ore	billion metric tons	54
Lead, Pb content	million metric tons	35
Lithium, Li content	thousand metric tons	1,530
Magnesite, $MgCO_3$ content	million metric tons	318
Manganese ore	do.	227
Mineral sands:		
Ilmenite	do.	139
Rutile	do.	22
Zircon	do.	38
Molybdenum, Mo content	thousand metric tons	190
Nickel, Ni content	million metric tons	19
Niobium (columbium) and tantalum:		
Niobium (columbium), Nb content	thousand metric tons	205
Tantalum, Ta content	do.	67
Platinum-group metals (Pd, Pt)	metric tons	1
Rare earths (REO plus Y_2O_3)	thousand metric tons	3,190
Silver, Ag content	do.	85
Tin, Sn content	do.	413
Tungsten, W content	do.	392
Uranium, U content	do.	1,080
Vanadium, V content	do.	1,900
Zinc, Zn content	million metric tons	63

do. Ditto.

[1] Data are rounded to no more than three significant digits.

[2] Accessible Economic Demonstrated Resources (AEDR) as of December 2014, as reported by Geoscience Australia. AEDR refers to the portion of total Economic Demonstrated Resources (EDR), which include Joint Ore Reserves Committee-compliant reserves and measured and indicated resources, that is accessible for mining. It excludes resources that are inaccessible for mining because of environmental restrictions, Government policies, or military lands.

THE MINERAL INDUSTRY OF BANGLADESH

By Yolanda Fong-Sam

In 2014, the mineral industry of Bangladesh produced mainly cement, coal, natural gas, iron and steel, petroleum, salt, and stone. The country lacks reserves of metallic minerals but is prospective for natural gas.

Bangladesh and neighboring countries Burma (to the east) and India (to the west) were involved in a maritime boundary dispute concerning their respective sovereignty in the Bay of Bengal. For many years, these countries had attempted to negotiate and delimit their claims in the disputed area. In July 2014, an arbitral tribunal established under Annex VII of the United Nations Convention on the Law of the Sea (UNCLOS) delimited the maritime boundary between Bangladesh and India, which included the territorial sea, an exclusive economic zone, and the continental shelf within and beyond 200 nautical miles. According to the Bangladesh Government, the Bay of Bengal had great potential for undersea resources; therefore, it was a priority for the Government to resolve the boundary disputes and open up its offshore entitlements to foreign investors for hydrocarbon exploration. In 2012, Bangladesh resolved its maritime dispute with Burma by a ruling made by the International Tribunal for the Law of the Sea (ITLOS) for the settlement of their boundary delimitation (Burke, 2014; Deutsche Welle, 2014).

Minerals in the National Economy

According to the Central Bank of Bangladesh, in fiscal year 2014 (July 1, 2013, to June 30, 2014), mining and quarrying accounted for about 1.6% of the country's gross domestic product (GDP), and the construction sector accounted for about 6.8% of the country's GDP compared with 6.5% in fiscal year 2013. Total foreign trade increased by 10.3% to $66.3 billion in fiscal year 2014 from $60.1 billion in fiscal year 2013. The country's total exports were valued at about $29.8 billion compared with $26.6 billion in fiscal year 2013, which was an increase of 12%; similarly, the total value of imports increased by 9% to $36.6 billion from $33.6 billion in fiscal year 2013. Imports of iron, steel, and other base metals (unspecified) were valued at $2.9 billion, which was an increase of 1% compared with that of fiscal year 2013. Imports of crude petroleum were valued at $72 million, which was an increase of 19.1% compared with that of fiscal year 2013 (Central Bank of Bangladesh, 2015, tables I.1, I.3, IV.3).

Production

Bangladesh produced small amounts of industrial minerals and processed products. In 2014, the level of production for most commodities remained similar to that of 2013, with the exception of coal, which increased by 10.3% to 942,796 metric tons (t); iron and steel products, which increased by 8.6% to 306,057 t; and granite, which decreased by 86% to 46,726 t (table 1).

Structure of the Mineral Industry

The Bangladesh Oil, Gas and Mineral Corp. (Petrobangla) is the Government entity that is responsible for the exploration, production, and transmission and distribution of natural gas and oil in Bangladesh. Petrobangla was also in charge of the development of coal and some nonfuel mineral deposits that included industrial mineral deposits. Oversight of the exploration for minerals, however, was the responsibility of the Geological Survey of Bangladesh (Bangladesh Oil, Gas and Mineral Corp., 2014, p. 17–18).

The exploration and production of coal and granite were performed by Petrobangla's subsidiaries Barapukuria Coal Mining Co. Ltd. (BCMCL) and Maddhapara Granite Mining Co. Ltd. (MGMCL), respectively. Eastern Refinery Ltd. (ERL), which was a subsidiary of Bangladesh Petroleum Corp. (BPC), was Bangladesh's sole petroleum-refining company (Bangladesh Oil, Gas and Mineral Corp., 2014, p. 38–39).

The major public gas-producing companies, which were under Petrobangla, were Bangladesh Gas Fields Co. Ltd. (BGFCL), Bangladesh Petroleum Exploration and Production Co. Ltd. (BAPEX), and Sylhet Gas Fields Ltd. (SGFL), and combined produced 46.5% of the country's total gas production for fiscal year 2014. The remaining 53.5% was produced by Chevron Corp., KrisEnergy Bangladesh Ltd., and Niko Resources Ltd. In fiscal year 2014, a total of 19 gasfields were in production from a total of 93 flowing wells (Bangladesh Oil, Gas and Mineral Corp., 2014, p. 19). Table 2 is a list of major mineral industry facilities.

Commodity Review

Metals

Iron and Steel.—In September, Nippon Steel and Sumitomo Metals Corp. (NSSMC) of Japan announced that it was preparing for the commission of a steel factory in Bangladesh by September 2014; however, commencement of operations could not be confirmed. NSSMC had signed a joint-venture agreement in December 2013, with locally owned McDonald Steel Building Products Ltd. to form Nippon and McDonald Steel Industries Ltd. The newly formed company was to build the factory, which would have had a production capacity of 15,000 metric tons per year of steel products. The factory was located in Chittagong, which is in the southeastern part of the country (Saha, 2014; Tsai, 2014).

Industrial Minerals

Cement.—In March, PT Semen Indonesia announced a proposed investment of $24.5 million for the installation of a cement grinding facility at an undisclosed site in Bangladesh. The company was also considering the option of buying an established grinding facility in lieu of constructing a new one. PT Semen planned to source the clinker from the company-owned Thang Long Cement plant located in Vietnam (International Cement Review, 2014).

Stone, Crushed.—MGMCL produced granite at Petrobangla's underground mine in the District of Dinajpur. The facility was the main source of construction aggregate in Bangladesh, and the granite produced was mainly sold domestically for use as construction material. In 2014, granite production decreased significantly to 46,726 t from 332,773 t in 2013 owing mainly to a workers' strike and a delay in explosives being supplied that paralyzed the facility for 114 days (Bangladesh Oil, Gas and Mineral Corp., 2014, p. 39).

Mineral Fuels and Related Materials

Coal.—The Barapukuria coal mine, which was managed by BCMCL, was the first and sole operating coal mine in Bangladesh. Commercial production started in 2005. The coal mine helped ease the country's demand for and dependence on natural gas. Coal produced from the mine was used mainly for power generation at the country's sole 250-megawatt capacity coal-fired thermal powerplant located near the mine in Barapukuria, Rangpur Division. Coal was also used in the brick industry and by the steel-rolling mills. During 2014, the Government was working towards the finalization of the National Energy Policy and the Coal Policy, which would set the standards and rules to develop the energy and coal extraction sector (Bangladesh Oil, Gas and Mineral Corp., 2014, p. 22, 38, 44).

In 2014, Petrobangla completed a seismic survey for the feasibility study of the Dighipara coalfield and also undertook the feasibility study for the extraction of coalbed methane at the Jamalganj coalfield. Both coalfields were discovered in 2012, along with the Khalashpir and the Phulbari fields; all these fields are located in northern Bangladesh (Bangladesh Oil, Gas and Mineral Corp., 2014, p. 22, 44).

Natural Gas.—In 2014, natural gas accounted for about 73% of commercial energy production in the country, which had undergone an increase in demand in recent years. The major public gas-producing companies in the country, BGFCL, BAPEX, and SGFL, produced a total of 10.8 billion cubic meters of natural gas during fiscal year 2014, which was about 46.5% of the country's total gas production. The international oil companies operating in the country (Chevron, KrisEnergy, and Niko Resources) produced 12.4 billion cubic meters of natural gas, or 53.5% of the country's total gas production (Bangladesh Oil, Gas and Mineral Corp., 2014, p. 19, 22).

In September 2013, Santos International Holdings Pty. Ltd. of Australia, which was the operator of Bangladesh's only offshore gasfield, announced that it was ceasing operations in the Sangu gasfield (Block 16) owing mainly to a significant reduction in natural gas production and to reserve depletion. According to Petrobangla, reserve estimates were lower than expected and over-production from the field led to the decline in output, which made it economically unviable to operate (Quadir, 2013; Bangladesh Oil, Gas and Mineral Corp., 2014, p. 19, 27).

By December 2014, a total of 26 gasfields had been identified throughout the country for a total recoverable proven and probable gas reserve of about 768 billion cubic meters, of which as much as 46% had already been produced. As reserves of natural gas continued to be depleted and demand to increase (mainly owing to increased infrastructure development), Petrobangla continued exploration and drilling activities. During 2014, Bangladesh's sole national exploration company, BAPEX, continued with a three-dimensional seismic survey program to survey and delineate the extension of identified fields, to increase the success rate of exploration and development of wells, and to estimate the content of gas-in-place in the identified fields. Since 2010 and up until 2014, BAPEX had surveyed about 2,400 square kilometers and had identified three new gasfields—the Rupganj, the Sundolpur, and the Srikail (Bangladesh Oil, Gas and Mineral Corp., 2014, p. 6, 8–9).

Gas Transmission Co. Ltd. (GTCL), which was under Petrobangla, was the Government-owned company that expanded, maintained, and operated the national gas grid and was in charge of the supply and usage of natural gas throughout the country. In fiscal year 2014, GTCL installed a total of 590.8 kilometers (km) of new gas transmission pipelines of various sizes across the country. The new addition contributed to Bangladesh's gas pipeline network, and as of December 2014, the total network encompassed nearly 23,027 km, of which 16,102 km was feeder and service lines; 2,570 km was distribution lines; 2,407 km was transmission lines; and 1,949 km was undefined. In December 2014, the Bibiyana-Dhanua (137 km) transmission pipeline was commissioned; it was considered the largest (in diameter) gas transmission pipeline to be built in the country. The Bibiyana-Dhanua pipeline, which passes through the districts of Gazipur, Habiganj, Kishoreganj, and Mymensingh, had a transmission capacity of 18 million cubic meters per day (Bangladesh Oil, Gas and Mineral Corp., 2014, p. 20, 33; Dhaka Tribune, 2014).

In 2014, Petrobangla estimated a supply shortage of liquefied natural gas (LNG) of 14.2 million cubic meters per day (reported as 500 million cubic feet per day). In order to compensate for the shortage, the Government had resorted to importing LNG, and was planning to install a floating LNG terminal and a floating storage and regasification unit in Chittagong. In addition, the Government planned to construct a 115-km-long transmission pipeline to connect Moheshkhali to Foujdarhat in Chittagong; both projects were expected to be completed by 2017 (Bangladesh Oil, Gas and Mineral Corp., 2014, p. 9, 21).

In October 2014, Chevron announced the commencement of natural gas production from the onshore Bibiyana expansion project, which would further increase the natural gas production capacity to 40 million cubic meters per day from 25.5 million cubic meters per day. Chevron's proposal included expanding the existing plant to process greater volumes of gas sourced from the Bibiyana gasfield (the leading supplier of gas to the national grid), developing additional wells, and upgrading the liquid gas recovery unit (Rigzone, 2014).

Petrobangla expected to begin planning for two wells at the Bangora gasfield to start production in 2015 to sustain the field's current production of 3.1 million cubic meters per day. Also, Petrobangla was planning for a round of bidding for its offshore areas in 2015. As part of the bidding process, Petrobangla would undertake a two-dimensional seismic survey of the country's offshore blocks to provide the necessary information for basin evaluation (Bangladesh Oil, Gas and Mineral Corp., 2014, p. 27–28).

Petroleum.—As of December 2014, and according to Government-owned BPC, no significant progress was reported for the installation of a second unit at the ERL refinery, which was scheduled to be commissioned by 2016. The addition of the new unit would increase the refinery's total capacity by 3.5 million metric tons per year (Mt/yr) to a total of about 5 Mt/yr of crude oil. The ERL refinery, which was located in Chittagong in southeastern Bangladesh, refined an average of 1.3 Mt/yr of crude oil (representing about 10% of the country's demand), although it had the capacity to refine 1.5 Mt/yr. BPC announced plans to invite investors to submit proposals for the Government's consideration. Several companies—including China National Petroleum Corp., Engineers India Ltd., and Wuhun Engineering Co. Ltd.—had expressed interest in the project, but no agreement had yet been reached (Ahsan, 2014; Rasel, 2014).

Outlook

In recent years, demand for primary energy in Bangladesh has increased significantly and Petrobangla has continued its commitment to the identification of new gasfields to increase the country's natural gas reserves by performing exploratory drillings and by conducting seismic surveys. Challenges facing the country include the ability to import and store LNG (projects are expected to commence in 2017) and the ability to accelerate projects that are being explored, develop them, and start production. In the near future, the gap between the demand for and supply of natural gas is expected to decrease as the Government implements projects that have started and progressed during 2014. The development of the coal industry is expected to accelerate as the Government finalizes its Coal Policy and its National Energy Policy.

Major objectives have been achieved by Bangladesh in recent years, mainly the peaceful resolution of its maritime boundary disputes with Burma (2012) and India (2014). These milestones offer a new opportunity for the country to open its offshore areas to hydrocarbon exploration and to attract foreign investors.

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TABLE 1
BANGLADESH: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
Cement, hydraulic[3]	thousand metric tons	13,770	14,690	5,000 [r, e]	3,461 [r]	3,570
Clays, kaolin[3]		8,500	--	--	--	--
Coal, bituminous[3]		666,635	861,072	854,805	854,804 [r]	942,796
Gas, natural, marketed[4]	million cubic meters	20,312	20,951	22,670	22,669 [r]	23,232
Iron and steel, metal, steel products[3]		60,000	--	--	281,715 [r]	306,057
Nitrogen, N content of urea, ammonia, ammonium sulfate		1,300,000	--	--	--	--
Petroleum:						
Crude	thousand 42-gallon barrels	1,800	--	--	2,580 [r]	2,528
Refinery products	do.	9,500	NA	NA	NA	NA
Salt, marine[3]		1,409,239	1,430,329	1,438,805	1,439,000 [r]	1,461,000
Stone:						
Boulder	thousand cubic meters	5,521	5,575	5,580	5,335 [r]	5,432
Granite, crushed		300,000	360,071	281,402	332,773 [r]	46,726

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. do. Ditto. NA Not available. -- Zero.

[1] Table includes data available through December 9, 2015.

[2] In addition to the commodities listed, construction materials (such as limestone), fertilizer, and sand and gravel are known to have been produced, but available information was inadequate to make reliable estimates of output.

[3] Data are for the fiscal year ending June 30 of the following year.

[4] Gross production was not reported; the quantity vented, flared, or reinjected was thought to be negligible.

TABLE 2
BANGLADESH: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Cement		Chhatak Cement Factory Ltd. (Bangladesh Chemical Industries Corp.)	Sunamganj, Chhatak	190.
Do.		Bangladesh Oil, Gas and Mineral Corp. (Petrobangla), 100%	Chittagong	1,000.
Do.		do.	Sylhet	1,100.
Do.		Cemex Cement Bangladesh Ltd.	Mahmudnagar	600.
Do.		HeidelbergCement Bangladesh Ltd.	Chittagong and Narayangonj (near Dhaka)	2,000.
Do.		Holcim (Bangladesh) Ltd.	2 plants in Meghnaghat (Narayanganj) and 1 plant in Mongla (Begerhat)	2,200.
Do.		Lafarge Surma Cement Ltd. (Lafarge Group and Cementos Molins S.A.)	Chhatak, Sunamganj	1,500 (1,150 clinker).
Do.		Meghna Cement Mills Ltd. (an enterprise of the Bashundhara Group of Bangladesh	Mongla Port Industrial Zone and Pashur River Bank facility	1,000.
Do.		Premier Cement Mills Ltd.	West Mukterpur in Munshigonj	2,400.
Do.		Shah Cement Industries Ltd.	Dhaka	1,860.
Do.		Unique Cement Industries Ltd.	Chittagong, Dhaka, and Sylhet	1,440.
Do.		Various	18 additional facilities	5,240.
Coal		Barapukuria Coal Mining Co. Ltd. (BCMCL) [Bangladesh Oil, Gas and Mineral Corp. (Petrobangla), 100%]	Barapukuria, Rangpur Division	1,825.
Fertilizer		Di-Ammonium Phosphate Fertilizer Co. Ltd. (Bangladesh Chemical Industries Corp.)	Anowara, Chittagong	528.
Do.		Jamuna Fertilizer Co. Ltd. (Bangladesh Chemical Industries Corp.)	Tarakandi, Jamalpur	561.
Do.		Natural Gas Fertilizer Factory Ltd. (Bangladesh Chemical Industries Corp.)	Fenchugonj, Sylhet	106.
Do.		Polash Urea Fertilizer Ltd. (Bangladesh Chemical Industries Corp.)	Palash, Narsingdi	95.
Do.		Triple Super Phosphate Complex Ltd. (Bangladesh Chemical Industries Corp.)	North Potenga, Chittagong	100.
Do.		Urea Fertilizer Factory Ltd. (Bangladesh Chemical Industries Corp.)	Ghorashal, Narsindi	470.
Gas, natural	million cubic meters per day	Bangladesh Gas Fields Co. Ltd. (BGFCL) [Bangladesh Oil, Gas and Mineral Corp. (Petrobangla), 100%]	Bakhrabad, Habiganj, Meghna, Narsingdi, and Titas gasfields	23.
Do.	do.	Bangladesh Petroleum Exploration and Production Co. Ltd. (BAPEX) [Bangladesh Oil, Gas and Mineral Corp. (Petrobangla), 100%]	Fenchuganj, Salda, Semutung, Shahbazpur, Srikail, and Sundalpur gasfields	4.
Do.	do.	Chevron Corp.	Bibiyana gasfield (Block 12)	40.
Do.	do.	do.	Jalalabad gasfield (Block 13)	7.
Do.	do.	do.	Maulavi Bazar gasfield (Block 14)	2.
Do.	do.	Niko Resources Ltd. (100%)	Chattak and Feni gasfields[1]	6.
Do.	do.	Sylhet Gas Fields Ltd. (SGFL) [Bangladesh Oil, Gas and Mineral Corp. (Petrobangla), 100%]	Beanibazar, Kailashtila, Rashidpur, and Sylhet gasfields	5.
Do.	do.	KrisEnergy Bangladesh Ltd., 30%; Niko Resources Ltd., 60%; and Bangladesh Petroleum Exploration and Production Co. Ltd. (BAPEX), 10%	Bangora gasfield (Block 9)	3.
Petroleum, refined	42-gallon barrels per day	Eastern Refinery Ltd. (ERL), Bangladesh Petroleum Corp. (BPC)	Chittagong	34,000.
Steel:				
Crude		Bangladesh Steel and Engineering Corp.	do.	20.
Products		Nippon and McDonald Steel Industries Ltd. (joint venture between Nippon Steel and Sumitomo Metals Corp. and McDonald Steel Building Products Ltd.)	do.	15.
Stone, boulder and crushed granite		Maddhapara Granite Mining Co. Ltd. (MGMCL) [Bangladesh Oil, Gas, and Mineral Corp. (Petrobangla)], 100%	Maddhapara, District of Dinajpur	1,650 (hard rock).

[e] Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.

[1] Inactive as of December 2014.

THE MINERAL INDUSTRIES OF BHUTAN AND NEPAL

By Yolanda Fong-Sam

BHUTAN

Bhutan, which is a landlocked country located in Southeast Asia between China and India, produced coal, ferrosilicon, iron ore, and a variety of industrial minerals used locally for construction and exports (table 1). In 2014, Bhutan's economy continued to grow steadily. According to the National Statistics Bureau of Bhutan, the gross domestic product (GDP) increased by 5.17% compared with an increase of 2.06% (revised) in 2013. The mining and quarrying sector contributed 2.8% to the country's GDP. The mineral industry of Bhutan was small in scale relative to its major industries, which included the construction sector and the hydroelectric power generation sector. The Government had been actively developing both sectors (construction and power generation) in recent years and had also stimulated the mineral industry by sourcing the construction materials needed for the country's infrastructure projects. In 2014, only 0.9% of the total number of people employed in the country worked in the mining and quarrying industry (National Statistics Bureau of the Royal Government of Bhutan, 2015, p. 69, 123, 234–235).

Bhutan's exports made up 30.6% of the country's total trade, and imports made up 69.4%. Hydropower was the country's leading exported commodity and constituted about 20% of the GDP. Bhutan's leading trading partners were Bangladesh and India for exports, and India and Japan for imports. In 2014, Bhutan exported ferrosilicon (reported as exports in table 1), dolomite (98% of production was exported), gypsum (89%), marble (64%), and coal (22%) (table 1; Department of Revenue and Customs, 2014, p. iv, vi–vii; Mallet, 2014; National Statistics Bureau of the Royal Government of Bhutan, 2015, p. 144).

Production

In 2014, Bhutan's primary mineral commodity output was industrial mineral products; these included cement, clay, dolomite, granite, gypsum, limestone, marble, quartzite, stone, and talc. Additionally, coal, ferrosilicon, and iron ore were produced. Increases in production were reported for coal (56.8%), talc (31.5%), gypsum (17.8%), dolomite (17.3%), and limestone (11.6%). Stone production was 1.47 million metric tons (Mt), almost equaling the 2012 level of 1.49 Mt after falling to 38,542 metric tons (t) in 2013. Production decreases were reported for granite (32.5%) and clay (32.7%). Data on mineral production are in table 1.

Structure of the Mineral Industry

The mineral industry of Bhutan was relatively undeveloped, and only 33% of the country had been geologically mapped in 2014. Mineral resources, such as coal, dolomite, gypsum, limestone, and slate were known to exist in Bhutan. In addition, the country had small deposits of granite, iron ore, marble, quartzite, pink shale, and talc. Most mining facilities consisted of small operations owned and (or) operated by private companies, and others were owned and (or) operated by Government enterprises, such as the Dungsam Cement Corp. Ltd., the Natural Resources Development Corp. Ltd., and the Penden Cement Authority Ltd. In 2014, the total number of industrial license holders was 2,823, of which only 3.2%, or 92 licenses, were related to the mineral industry. There were 33 mines and 48 quarries operating in the country. Table 2 is a list of major mineral industry facilities in Bhutan (Royal Audit Authority, 2014, p. 3; National Statistics Bureau of the Royal Government of Bhutan, 2015, p. 123, 125).

Commodity Review

Industrial Minerals

Cement.—In 2014, Dungsam Cement Corp. Ltd., which was wholly owned by Druk Holding and Investments Ltd. (DHI), produced 200,181 t of cement; of this amount, 41% was sold and used for the construction of hydropower projects and other infrastructure construction projects in the country, 38% was exported, and 21% was sold locally to other buyers. The company also produced 396,657 t of clinker, of which about 98% was sold to India and the remaining 2% was consumed domestically (Druk Holding and Investments Ltd., 2014, p. 34).

In January, Dungsam Cement obtained a license to sell cement to India and planned to increase its cement exports by up to 80% of the company's production owing mainly to the relatively small market in Bhutan. The company reportedly planned to operate the plant at close to its capacity of 4,130 metric tons per day (t/d) (Global Cement, 2014).

Dolomite.—In 2014, DHI started investing in a dolomite manufacturing project, which would produce dolomite refractory bricks and high-alumina-content refractory products in bricks to be used by the ferrous and industrial manufacturing sectors. The company also completed a feasibility study for the plant, which would be located in Gomtu and managed by OCL India Pvt. Ltd. of India. DHI also acquired environmental clearance from the Government to develop a dolomite mine in Samtse District. The project would be managed by OCL Bhutan Ltd., which was a joint venture between DHI and OCL India Pvt. Ltd. (Druk Holding and Investments Ltd., 2014, p. 19).

Mineral Fuels and Other Sources of Energy

Hydropower.—According to the National Statistics Bureau of Bhutan, the total installed electricity generation capacity of the country was nearly 1,500 megawatts (MW) in 2014. Most of the electricity were generated at the following hydropower facilities—Basochu I, Basochu II, Chhukha, Kurichu, and the Tala Hydropower Project Authority (National Statistics Bureau of the Royal Government of Bhutan, 2015, p. 120).

Bhutan's feasible hydropower potential was assessed to be about 24,000 MW, of which only 6% had been installed. In recent years, neighboring India had been involved in Bhutan's development of its hydropower industry by providing technical knowledge and funding for the construction of hydropower plants. India also would import most of the electricity produced, which in turn would generate export revenues and promote the economic growth of Bhutan. An agreement between the countries was formally established in 2009, and India committed to supporting Bhutan in the installation of 10,000 MW of hydropower capacity by 2020. India also agreed to import all of Bhutan's electricity surpluses. The plan to reach the capacity goal of 10,000 MW included the construction of 10 hydropower projects, of which 3—Punatsangchu I (1,200 MW), Punatsangchu II (1,020 MW), and Mangdechhu (720 MW)—were under construction in 2014 and were expected to be commissioned between 2017 and 2018. In April, Bhutan and India signed an inter-Governmental agreement for the joint development of four additional hydropower projects (Economic Times, 2014; Harris, 2014; Dharmadhikary, 2015).

In 2014, the Asian Development Bank (ADB) continued its commitment to improve Bhutan's energy sector by investing in the development of its hydropower industry. As of December, the ADB was providing assistance for the construction of the Dagachhu hydropower plant, which was expected to be commissioned in 2015, and the Nikacchu hydropower plant, which was expected to be commissioned in 2019 (Asian Development Bank, 2014a; 2014b, p. 1; Druk Holding and Investments Ltd., 2014, p. 18; Mallet, 2014).

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NEPAL

Nepal, which is a landlocked country located in Southeast Asia between China and India, produced coal, gemstones, steel, and a variety of industrial minerals, such as cement, clay, quartzite, stone, and talc. In 2014, Nepal's economy continued to grow steadily; according to the Central Bureau of Statistics of Nepal, the GDP rate of growth was 5.15% compared with 3.46% (revised) in 2013. The mining and quarrying sector contributed less than 1% to the country's GDP in 2014. The mineral industry of Nepal was small in scale relative to other major industries, such as the construction sector, which contributed 6.3% to the country's GDP in 2014. The country's steep topography has proven to be a challenge for the mining industry; therefore, mineral resources were mostly unexploited. Nepal was thought to have small deposits of metallic and nonmetallic mineral resources, such as cobalt, copper, iron ore, lead, magnesite, and zinc. In 2014, exports made up 12.7% of total trade, and imports made up 87.3%. The leading trading partners were India (60%) and the United States (9%) for exports, and India (57%) and China (30%) for imports (table 1; Central Bureau of Statistics, 2014; Asian Development Bank, 2014b, p. 5–6).

In 2014, the Asian Development Bank (ADB) continued its commitment to improve Nepal's infrastructure through the ADB country partnership strategy that prioritized the development of energy, transportation, water, and urban infrastructure projects. The ADB sought to improve the generation, transmission, and distribution of energy and to reduce power shortages, and to continue its support of the construction of a road network to connect the country to other regional markets (Asian Development Bank, 2014a).

Production

Nepal's mineral industry was dominated by the production of industrial minerals, which were used mainly for domestic construction. Cement and brick production were Nepal's main mineral-related industries. Preliminary production data from the Department of Mines and Geology of Nepal reported significant decreases in the production of coal (85.2%), clay (73.8%), talc (61.2%), limestone (49.2%), and marble chips (15.7%) (table 1).

Structure of the Mineral Industry

The production of cement and the generation of hydropower were the two main industries in Nepal. The country had become almost self-reliant in cement production, and as cement manufacturers started production in recent years, the demand for electricity increased. The country's cement operations were mostly privately owned. In 2014, according to the Nepal Cement Manufacturers Association, 44 cement plants were operating in the country, of which 12 had their own clinker production units. Table 2 is a list of major mineral industry facilities in Nepal (Kathmandu Post, The, 2014).

Commodity Review

Industrial Minerals

Cement.—In recent years, the demand for cement had increased significantly owing to the Government's infrastructure improvement plans, which included the construction of bridges, dams, and housing. In 2014, Chaudhary Group commissioned a cement factory with the capacity to produce 1,200 t/d. The plant was located in Palpa in western Nepal. In January, Dangote Group of Nigeria announced plans to invest $800 million to build a cement plant in Nepal and asked the Government to assist it in locating a site. The plant would include its own powerplant, which would have 30 MW of electricity-generating capacity, and the company asked the Government to provide an additional 30 MW of generating capacity to ensure proper operation of the plant (Global Cement, 2014b; Kathmandu Post, The, 2014).

In December, Arghakhanchi Cement, which is located in Bhairahawa, was set to start production at its 1,200-t/d-capacity plant. Kadiya Group, Murarka Group, and Siddhartha Group of Nepal each owned shares in the plant. Three mines, located in Narapani and Khanchikot in Arghakhanchi District and in Jonchha in Palpa District respectively, would provide limestone for the Arghakhanchi cement plant (Global Cement, 2014a).

In December, Sarbottam Cement Industries (SCI) started commercial operations at its 400,000-metric-ton-per-year cement plant. The plant, which cost $64 million to build, included a powerplant and a grinding unit (Global Cement, 2014c).

Mineral Fuels and Other Sources of Energy

Hydropower.—Nepal had the potential to develop its hydropower industry, which had the potential of a commercially feasible capacity of 80,000 MW, although only 700 MW had been installed. In September, the Investment Board of Nepal signed a foreign investment agreement to build a 900-MW-capacity hydropower plant in the Karnali River at a cost of $1.4 billion. GMR (an infrastructure group in India that held a 73% share in the project), was contracted to build the plant. The Government of Nepal would hold a 27% share in the project and would receive 12% of the electricity; the remaining output was expected to be exported to India. The project was expected to be commissioned in 2021 (Mallet, 2014).

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TABLE 1
BHUTAN AND NEPAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity[2]		2010	2011	2012	2013	2014
BHUTAN						
Cement[e]	thousand metric tons	200	544	521	500	600
Clay		--	--	7,353	15,166	10,209
Coal, bituminous		87,815 [r]	108,904	98,731	77,744 [r]	121,891
Dolomite		1,214,620 [r]	1,082,301 [r]	1,499,535 [r]	1,740,016 [r]	2,040,691
Ferrosilicon[3]		97,528	96,711	107,819	110,000 [e]	110,000 [e]
Granite		9,396 [r]	463 [r]	1,807 [r]	6,464 [r]	4,362
Gypsum		344,034	352,234 [r]	313,173 [r]	351,421 [r]	414,148
Iron ore:						
Gross weight		--	--	3,742 [r]	20,506 [r]	18,997
Metal content		--	--	2,300	12,700	11,800
Limestone		704,912 [r]	649,291	677,129 [r]	1,006,235 [r]	1,122,825
Marble		71,278 [r]	71,582	59,542 [r]	60,708	61,921
Quartzite		111,371 [r]	95,016 [r]	88,631 [r]	90,909	83,907
Stone		6,649,978 [r]	1,842,679 [r]	1,494,467	38,542 [r]	1,474,395
Talc		40,204 [r]	8,562	16,063 [r]	9,584	12,601
NEPAL						
Cement[e]	thousand metric tons	1,360	2,200	2,700	3,000	3,000
Clay, red	cubic meters	6,705 [4]	9,066	13,400 [4]	18,070 [r,4]	4,735 [p]
Coal, bituminous		3,391 [4]	10,904	14,084 [4]	8,051 [r,4]	1,189
Gemstones:	kilograms					
Kyanite		NA	2,980	1,934 [4]	1,187 [r,4]	1,200 [e]
Quartz		1,000	560	1,114 [4]	4,256 [r,4]	4,000 [e]
Tourmaline		NA	--	--	696 [r,4]	700 [e]
Quartzite, slab[e]	square meters	3,000	-- [r]	--	2,000	2,500
Steel, rolled[e]	thousand metric tons	85	80	80	80	80
Stone:						
Limestone		580,000	1,276,452	4,719,542 [5]	3,371,071 [r,4]	1,713,372
Marble:						
Aggregate	cubic meters	NA	13,593	--	--	--
Chips	do.	1,330 [3]	1,969	2,995	2,436 [r,4]	2,054
Slab, cut	do.	500	13,595	--	--	--
Talc		1,655 [3]	6,935	5,140	5,703 [r,4]	2,211

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. do. Ditto.
NA Not available. -- Zero.

[1] Table includes data available through December 23, 2015.

[2] In addition to the commodities listed, metallic commodities, such as copper wire, lead, manganese, and zinc, and crude construction materials, such as sand and gravel, presumably were produced in Bhutan and Nepal, but information was inadequate to make reliable estimates of output.

[3] Data compiled from the United Nations Comtrade database for all ferrosilicon exported from Bhutan.

[4] Data are for the fiscal year ending July 15 of the following year.

TABLE 2
BHUTAN AND NEPAL: STRUCTURE OF THE MINERAL INDUSTRIES IN 2014

(Thousand metric tons unless otherwise specified)

Country and commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity^e
BHUTAN			
Cement	Dungsam Cement Corp. Ltd. (Druk Holding and Investments Ltd., 100%)	Nganglam, Pemagatshel District	1,500
Do.	Penden Cement Authority Ltd. (Druk Holding and Investments Ltd., 40.3%)	Gomtu, Samtse District	375
Coal	Goop Sonam Drukpa	Eastern Bhutan coalfields	NA
Dolomite	Jigme Mining Corp. Ltd.	Chunaikhola Mine, Samtse District	2,000
Ferrosilicon	Bhutan Ferro Alloys Ltd. (Druk Holding and Investments Ltd., 25.7%) (Government of Bhutan, Marubeni Co., and Tashi Commercial Co.)	Phuentsholing, Lhukha District	110
Gypsum	Druk Satair Corp. Ltd.	Khothakpa Mine, Pemagatshel District	NA
Limestone	Bhutan Coal Co. Ltd.	Haurikhola Mine, Samtse District	NA
Do.	Dungsam Cement Corp. Ltd. (Druk Holding and Investments Ltd., 100%)	Kangrezi Mine, Pemagatshel District	NA
Do.	do.	Marung Ri Mine, Pemagatshel District	NA
Do.	Penden Cement Authority Ltd.	Penden Mine, Samtse District	NA
Do.	do.	Uttare Mine, Samtse District	NA
Quartzite	Bhutan Ferro Alloys Ltd.	Pakchina Mine, Chukha District	NA
Do.	do.	Tintale Mine, Samtse District	NA
Stone	Natural Resources Development Corp. Ltd.	Homdhar quarry, Zhemgang District	NA
Do.	do	Ngangsing quarry, Pemagatshel District	NA
Do.	do.	Tsangkhar quarry, Monggar District	NA
NEPAL			
Cement	Araniko Cement Industries	Jitpur factory	NA
Do. metric tons per day	Arghakhanchi Cement	Bhairahawa	1,200
Do. do.	Dang Cement Industries Pvt. Ltd. (Ambuja Cement Ltd., 85%)	NA	1,200
Do. do.	Chaudhary Group	Palpa, western Nepal	1,200
Do. do.	Jagdamba Cement	Bhairahawa	1,200
Do. do.	do.	Birgunj	1,000
Do.	Lhaki Cement Pvt. Ltd.	Bhawani Khola	660
Do.	Hetauda Cement Industries Ltd.	Hetauda, Makwanpur District	260
Do.	Manasa Cement Industry	Chandragadhi, Jhapa District	37
Do.	Maruti Cement	NA	NA
Do.	Saurabh Group	Sarbottam Cement Industries	400
Lead and zinc	Nepal Metal Co. Ltd. [Government (71%), and Khetan Group (13%)]	Lari	NA
Magnesite metric tons	Nepal Orind Magnesite Ltd. [Government (75%); Khetan Group (12.5%); Orissa Industries Ltd. (12.5%)]	Dolkha District	50
Marble	Godavari Marble Industries Ltd.	Godawari, Latitpur District	1

^{e}Estimated. Do., do. Ditto. NA Not available.

THE MINERAL INDUSTRY OF BURMA

By Yolanda Fong-Sam

In 2014, Burma (also known as Myanmar) produced a variety of mineral commodities, including antimony, cement, coal, copper, lead, manganese, natural gas, nickel, petroleum, petroleum products, precious and semiprecious stones, tin, tungsten, and zinc (table 1).

Since 2012, Burma has undergone many political changes, including reforms to law and government policies, that directly affected the country's economy, social wellbeing, and stability. Many changes were a result of the Government starting to implement more democratic reforms following more than 50 years of military rule and the subsequent lifting of sanctions imposed by Western countries. The changes were stimulating interest in foreign direct investment (FDI) in the country, especially in the mining and industry sector. In fiscal year 2015 (which ran from April 1, 2014, to March 30, 2015), FDI in Burma amounted to $8 billion invested in a total of 211 projects compared with $4.1 billion invested in 123 projects in fiscal year 2014 and $1.4 billion invested in 94 projects in fiscal year 2013. Investments in fiscal year 2015 were made by partners from Singapore (43 projects), China (34), Hong Kong (27), and the United Kingdom (12), among others. Burma's leading investor was Singapore (which invested $4.297 billion) followed by the United Kingdom ($721.9 million), Hong Kong ($624.8 million), and China ($516.9 million) (Central Statistical Organization, 2015).

The legal and regulatory framework related to FDI includes the Foreign Investment Law of 2012, the Foreign Investment Rules of 2013, and Notification No. 49/2014 (New Notification) of August 2014 issued by the Myanmar Investment Commission. The New Notification clarifies the type of activities in which foreign investments are prohibited or restricted. According to Burma's Ministry of Mines, the set of laws and notifications related to FDI were created to attract interest from investors and included such provisions as exemption from commercial tax on profits that are planned to be reinvested in the country within 1 year, 5 years of tax holiday instead of 3 years, income tax relief of up to 50% on export profits, granting foreign firms the ability to fully own ventures in the country, and the promise from the Government not to nationalize the business while the contract is in place. The Ministry of Mines also recommended the amendment of the country's Mining Law in the near future to be in accordance with international standards, reform of the banking system, and an increase in the country's technical knowledge as a means to increase national productivity and self-sufficiency (Aung, 2014; Finch, undated).

Minerals in the National Economy

According to the Asian Development Bank, the mining sector (at current prices) contributed 7.3% to Burma's gross domestic product (GDP) in fiscal year 2015 compared with about 6% in fiscal year 2013. The construction sector contributed 5.8% to the GDP compared with 5.3% in 2013 (Asian Development Bank, 2015, p. 1).

Burma's total trade value for fiscal year 2015 was $29.15 billion, of which exports were valued at $12.52 billion and imports, $16.63 billion. In 2014, the value of natural gas exports was $5.2 billion; jade exports, about $1 billion; and base metals and ores exports, $440.4 million. The major mineral products imported by Burma were base metals and manufactured goods, which were valued at $1.931 billion; cement, $301.4 million; and coal and coke, $110.1 million. Burma's main tradining partner in 2014 was China. Burma exported 37.3% of its total exports to China and imported 30.2% of its total imports from China. Other trading partners included Japan, Singapore, and Thailand (Central Statistical Organization, 2015).

Production

During 2014, Burma's mineral industry reported production increases for most commodities compared with these of 2013. For the metals mining sector, the production of nickel (133%) and ferronickel (more than 1,000%) increased substantially, mainly as the Tagaung Taung nickel project began reaching its designed capacity. Other increases in production included tin ores and concentrates (289%), lead (54%), copper (33%), and zinc (27%); however, decreases were reported for antimony (54%) and manganese (39%). In the industrial minerals sector, increases were reported for dolomite (450%), gypsum (74%), and cement (18%). A decrease was reported for barite (26%). In the mineral fuels sector, the only significant production increase was that of natural gas (36%), and a small decrease was reported for crude petroleum (4%) (table 1).

Structure of the Mineral Industry

The mineral sector in Burma included mining and mineral processing industries, which were mainly Government owned, although increased FDI had increased foreign investors' participation in the country's mining sector. According to the Ministry of Mines, in 2014, the country granted three kinds of mining permits—for exploration (485), large-scale mining (132), and small-scale mining (1,089) (Aung, 2014).

Table 2 lists Burma's major mineral industry facilities.

Commodity Review

Metals

Gold.—In October 2014, Centurion Minerals Ltd. of Canada announced the completion of an exploration program (phase 1) in the company's concession called the Slate Belt. The phase 1 program resulted in the identification of six preliminary exploration targets, which were to be further studied in the next phase. The initial exploration phase, which was initiated in

March, included the assessment of historical gold occurrences, delimiting the property boundaries, geologically mapping the area, and performing geochemical analyses. The property is located 125 kilometers (km) south of Mandalay City and covers an area of 692 square kilometers (km²). Centurion (80%) held an exploration permit valid for 5 years with local partner Crown Minerals Co. (20%) (Centurion Minerals Ltd., 2014a, b).

Iron and Steel.—In June 2014, Millcon Steel of Thailand (51%) signed a joint-venture agreement with Thiha Group of Burma (49%) to engage in the trade of steel and construction materials in Burma. The joint company was registered in Burma as Millcon Thiha Co. In July, Millcon Steel announced a joint-venture agreement with two other (undisclosed) companies for the construction of a steelworks facility to produce and distribute structural steel. No further details were announced (Loo, 2014; Nation, The, 2014).

Nickel.—In 2014, the production of nickel and ferronickel increased substantially by 133% and more than 1,000%, respectively, as a result of the commissioning of the first ferronickel furnace in the Tagaung Taung nickel project. The 2014 production represented the first full year of production of the ferronickel furnace, which officially started producing in March 2013. The project is located in Thabeikying, Mandalay Region, in central Burma. The plant, which had a design capacity of 25,000 metric tons per year (t/yr) of nickel metal and an estimated capacity of 85,000 t/yr of ferronickel, was operated by China Nonferrous Metal Mining Co. Ltd. under a production-sharing contract with state-owned Mining Enterprise No. 3 of Burma. China ENFI Engineering Corp. was in charge of the design of the plant (Yu, 2012; China Metallurgical Group Corp., 2013).

As of December 2014, the Mwetaung ferronickel project, which was proposed by North Mining Investment Co. Ltd., was still in the feasibility stage. According to the Ministry of Mines, a preliminary survey of the area that covered Mwe Mountain and Phar Mountain was completed in December 2012. The company awaited the feasibility study results on the potential of the property to produce ferronickel concentrates from low-grade laterite ores. The project is located in Teetain Township, Sagaing Region, in Chin State (Mann, 2014; Ministry of Mines, 2014a, b).

Tin.—In 2014, Burma's production of tin ores and concentrates increased by 289%. The increase was fueled mainly by increased demand from the Chinese electronics industry after Indonesia implemented tighter restrictions on tin exports. Indonesia, which had been China's main partner for tin supply, banned the exports of tin ingots in July 2013. After the ban was put in effect, China turned to Burma for tin imports, which included ores and concentrates. During 2014, Burma was the top supplier of tin ore to China (Yam, 2013; Scrap Register, 2014).

Industrial Minerals

Cement.—In 2014, cement production in Burma increased by 18% compared with that of 2013. During 2014, many cement projects and expansions were proposed, as domestic demand had increased owing to infrastructure improvements.

In March, Italcementi Group of Italy expressed interest in entering Burma's cement market. The company sought local partners for negotiations and was considering the country's foreign investment laws and regulations before finalizing a decision. In July, Siam Cement Group of Thailand announced plans to invest $400 million in the construction of a cement plant in Burma with a capacity of 1.8 million metric tons per year. The company planned to manufacture cement initially and offer other construction products, such as concrete and blocks, in the near future. The plant was expected to be commissioned by 2016 (Global Cement, 2014b–c).

Since mid-2014, Semen Indonesia (Persero) Tbk PT (SMGR) had been in negotiations with a local (undisclosed) cement producer for a joint-venture partnership; however, in September, the company decided to postpone its plans, primarily because of disagreements on ownership terms. SMGR was interested in acquiring a cement firm in Burma through a joint venture and had proposed a 20% stake as well as the right to function as the operator of the project and the distributor of the products. SMGR had planned to invest $300 million in the venture (Lubis, 2014).

In November, Myint Investment Group Co. Ltd. of Burma entered into a joint-venture agreement with Anhui Conch Cement of China to form Myanmar Conch Cement Co. Ltd. The new company was created to upgrade the No. 33 Kyaukse cement plant located in Kyaukse, Mandalay Region. The upgrade would increase the plant's capacity to 5,000 metric tons per day (t/d) of clinker from 400 t/d; however, no expected date of completion was released (CemNet, 2014; Global Cement, 2014a).

Mineral Fuels

Oil and Gas.—In 2014, exports of natural gas accounted for 41% of total exports, by value. The production of natural gas increased by 35.5% from that of 2013; the increase could be attributable in part to the start of production at the Shwe natural gas project and the Zawtika natural gas project. The Shwe project consisted of the Shwe, the Shwe Phyu, and the Mya offshore gasfields, which are located in Block A1 and Block A3 off the coast of Rakhine State in the Bay of Bengal. Commercial gas production in the Shwe project started in August 2013 from the Mya field, followed by the start in production of the Shwe field in January 2014. The combined natural gas reserve of the three gasfields was estimated to be 128 billion cubic meters (table 1; Nyein, 2015; Offshore Technology, undated a).

The Zawtika natural gas project included the Gawthaka, the Kakonna, and the Zawtika offshore gasfields, which are located in Block M9 and Block M11 in the Gulf of Martaban. The project, which was developed at a cost of $2 billion, started gas production in March 2014 and, by August, began exporting to Thailand. The combined natural gas reserve for the Zawtika project was estimated to be 56 billion cubic meters (Offshore Technology, undated b).

Between 2013 and 2014, the Government awarded 16 onshore and 20 offshore oil and gas exploration blocks in the Bay of Bengal, the Gulf of Martaban, and the Rakhine Basin. The concessions were expected to start exploration activities after 2015. In 2014, the major producing offshore oil and gas fields were the Shwe, the Yadana, the Yetagun, and the Zawtika fields (Nyein, 2015).

In March, partners ConocoPhillips Co. of the United States and Statoil ASA of Norway were awarded exploration Block AD–10 located in the Bay of Bengal. The block covered an area of 9,000 km² and was located about 200 km off the coast. Each partner owned a 50% equity share in the project, and Statoil was the operator. During the 2.5-year exploration period, Statoil planned to acquire and analyze two-dimensional seismic imagery and to conduct an environmental impact assessment and a social impact study (MBendi, 2014b).

Also in March, offshore exploration Block A5 was awarded to Unocal Myanmar Offshore Co. Ltd. (a subsidiary of Chevron Corp. of the United States). Block A5 is located in the Rakhine Basin, about 200 km northwest of Yangon, and covered an area of 10,600 km². Unocal is the operator of the block and held a 99% interest in the project; the remaining 1% interest was held by Royal Marine Engineering and Trading Co. Ltd. of Burma (MBendi, 2014a).

Also in March, Roc Oil Co. Ltd. (ROC) of Australia announced that the Ministry of Energy had awarded the company a production-sharing contract for Block M07. The block is located in the Moattama Basin at the mouth of the Irrawaddy Delta and covered an area of approximately 13,000 km². ROC operated the project and held a 59.375% interest in a joint venture. During an 18-month period, the company was to conduct an environmental impact assessment and other studies (MBendi, 2014b).

Outlook

Although the international community has suspended most of the sanctions against Burma, the country's transition to an open market economy will take time as reforms need to be formulated, approved, and implemented at many levels of Burma's Government. Challenges and risks include the maintenance of economic and political stability and the reform of the country's legal framework.

During 2013 and 2014, the Government worked toward revamping the foreign investment laws and mining regulations to increase foreign interests in the mining sector. The Government has also prioritized projects to improve infrastructure and reliable energy sources to support the rapid changes in the mining industry. The mining industry faces challenges, such as the lack of understanding of the country's geology and its mineral resources and the deficiency in skilled labor, technical knowledge, and the modern technology needed to drive the mining industry forward.

The exploration for and production of metals and industrial minerals are expected to increase in the near future as new developments and expansion projects progress and mines and plants start being commissioned in the next few years. In particular, cement production would increase as new projects start to be commissioned. Increases in cement consumption will likely be directly influenced by the Government's infrastructure plans, which include the construction and improvement of highways and housing projects. Also, the nickel sector is expected to increase production in the near future as the Tagaung Taung nickel project reaches its designed capacity. The development of other mining projects will be subject to the continuing demand for mineral commodities from neighboring countries and world market prices.

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TABLE 1
BURMA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011[e]	2012	2013	2014
METALS						
Antimony, Sb content[e, 3]		4,700 [r]	5,600 [r]	5,900 [r]	7,200 [r]	3,300
Copper:						
Mine output, Cu content		9,000	9,000	19,000 [e]	25,000	33,200
Metal, refined		9,000	9,000	19,000 [e]	25,000	33,200
Gold, refined	kilograms	NA	NA	787 [4]	893 [4]	900 [e]
Lead:						
Mine output, Pb content[e, 5]		7,000	8,700 [6]	9,800 [6]	11,700	18,000
Metal, refined		200 [r]	200 [r]	200	200	200
Manganese:						
Gross weight		749,600	586,000	286,300	393,800	241,800
Mn content		299,900	234,400 [6]	114,500 [r]	157,000 [r]	96,700
Nickel:						
Mine output, Ni content[e]		--	800	5,000	9,000 [r]	21,000
Ferronickel[e, 7]						
Ni content		NA	NA	--	1,200 [r, p]	15,300 [p]
Gross weight		NA	NA	--	4,800 [r, p]	59,000
Tin, mine output:[8, 9]						
Ores and concentrates[e]		800 [r]	2,200 [r]	2,100 [r]	9,000 [r]	35,000
Metal, refined[e]		30	30	30	30	30
Tungsten, mine output, W content:[6]						
Tungsten concentrate		2	--	1 [r]	--	3
Tin-tungsten concentrate[9]		161	140	130	140 [r]	140
Total		163	140	131 [r]	140 [r]	143
Zinc, mine output, Zn content[e, 5]		8,600	9,300 [6]	10,000 [r]	4,800 [r]	6,100

See footnotes at end of table.

TABLE 1—Continued

BURMA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011[e]	2012	2013	2014
INDUSTRIAL MINERALS						
Barite		8,975	30,000	21,539 [3]	31,295 [3]	23,060
Clay, bentonite		NA	NA	--	1,552	NA
Cement, hydraulic		534,034	538,000	922,074 [r, 4]	1,120,783 [r, 4]	1,317,163 [4]
Gypsum		81,051	50,000	38,579 [r]	60,510 [4]	104,994
Precious and semiprecious stones:						
Jade	kilograms	38,990,035	45,000,000	19,080,442 [4]	15,061,927 [r, 4]	16,684,386
Ruby	do.	1,612,070	870,000	852,033 [4]	443,510 [r, 4]	496,947
Sapphire	do.	1,311,327	1,500,000	1,351,916 [4]	1,142,291 [r, 4]	1,214,687
Spinel	do.	618,730	620,000	514,052 [4]	466,138 [r, 4]	525,594
Salt:						
Brine		97,136	100,000	NA	NA	NA
Rock, crude		NA	NA	207,261 [4]	169,109 [r]	187,616
Stone:						
Dolomite		3,119	2,000	170 [4]	400 [4]	2,200
Limestone, crushed and broken[e]	thousand metric tons	3,200	3,200	5,500 [r]	6,700 [r]	7,900
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite		217,650	300,000	471,022 [4]	380,272 [4]	386,732
Gas, natural, marketed	million cubic meters	12,425	12,500	13,225 [r, 4]	13,657 [r, 4]	18,503
Petroleum:						
Crude	thousand 42-gallon barrels	6,806	6,400	6,197 [4]	6,115 [r, 4]	5,851
Refinery products[10]	do.	4,851	5,000	4,029 [4]	3,054 [r, 4]	3,090

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. do. Ditto.
NA Not available. -- Zero.

[1] Table includes data available through November 20, 2015.

[2] In addition to the commodities listed, copper matte, construction aggregates, diamond, feldspar, iron and steel, lead (antimonial), nitrogen (ammonia), sand and gravel, silica sand, and silver were produced, but available information was inadequate to make reliable estimates of output.

[3] Data estimated from the United Nations Comtrade database for antimony ores and concentrates imported from Burma by China, India, Singapore, and Thailand.

[4] Data are for the fiscal year ending March 31 of the following year.

[5] Data are for the production by the state-owned mining enterprises under the Ministry of Mines.

[6] Reported figure.

[7] Data estimated from the United Nations Comtrade database for ferronickel imported from Burma by China and the Netherlands.

[8] Production of tin, mine output, Sn content production as reported by the Government, in metric tons, was 2010—374, 2011—350, 2012—576, 2013—443, and 2014—347.

[9] Data estimated from the United Nations Comtrade database for tin ores and concentrates imported from Burma by China, Malaysia, and Thailand.

[10] Includes diesel, distillate fuel oil, gasoline, jet fuel, kerosene, and residual fuel oil.

Sources: Ministry of Mines and Central Statistical Organization (Yangon), Selected Monthly Economic Indicators, January 2010, December 2010, September 2011, May 2014, March 2015.

TABLE 2
BURMA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity^e
Cement	AAA Cement International Co. Ltd.	Cement plant in Kyaukse, Mandalay Region	180,000.
Do.	Dragon Cement Co., Ltd.	Cement plant in Pinlaung, Shan State	180,000.
Do.	Mandalay Cement Industries Co. Ltd.	Cement plant in Kyaukse, Mandalay Region	135,000.
Do.	Max Cement (Subsidiary of Max Myanmar Holding Co. Ltd.)	Cement plant in Aung Nan Cho Village, Lewe, Naypyidaw Township, Mandalay Region	150,000.
Do.	Myanma Ceramic Industries	Cement plant in Kyangin, Ayeyarwady Region	363,000.
Do.	do.	Cement plant in Kyaukse, Mandalay Region	120,000.
Do.	do.	Cement plant in Thayet, Magway Region	170,000.
Do.	Myanmar Conch Cement Co. Ltd. (Myint Investment Group Co. Ltd. and Anhui Conch Cement)	No. 33 Kyaukse cement plant located in Kyaukse, Mandalay Region	NA.
Do.	Myanmar Economic Corp. Myaing Galay 1	Cement plant in Hpa An, Kayin State	240,000.
Do.	Myanmar Economic Corp. Myaing Galay 2	do.	1,200,000.
Do.	Naypyidaw Development Committee	Cement plant in Naypyidaw Township, Mandalay Region	150,000.
Do.	Tiger Head Cement (Myanmar)	Cement plant in Kyaukse, Mandalay Region	90,000.
Do.	Tun Thwin Mining Co. Ltd.	Kalay Cement Plant in Indinggyl Village, Kalay Township, Sagaing Region	NA.
Do.	Union of Myanmar Economic Holdings Ltd. Sin Min 1	Cement plant in Kyaukse, Mandalay Region	330,000.
Do.	Union of Myanmar Economic Holdings Ltd. Sin Min 2	do.	NA.
Do.	Yangon City Development Committee	Myodaw cement plant in Thazi Mandalay Region	150,000.
Coal	Tun Thwin Mining Co. Ltd. and Mining Enterprise No. 3 (ME–3)	Paluzawa coal mine located in Kalewa area in Sagaing Region	100,000.
Copper	No. 1 Mining Enterprise, 51%, and Myanmar Yang Tse Copper Ltd. (Wanbao Mining Ltd. and Union of Myanmar Economic Holding Ltd.), 49%	Monywa copper project, S&K Mine, and Monywa solvent extraction electrowinning plant in Monywa Region	40,000.
Fertilizer, urea	Myanma Petrochemical Enterprise (Government, 100%)	No. 1 fertilizer plant at Sale, 190 kilometers southwest of Mandalay Region	169,725.
Do.	do.	No. 2 fertilizer plant at Kyun Chaung, Magway Region	75,600.
Do.	do.	No. 3 fertilizer plant at Kyawzwa, Magway Region	219,000.
Do.	do.	No. 4 fertilizer plant at Myaungdaga	182,500.
Do.	do.	No. 5 fertilizer plant at Kangyidauk Township	182,500.

See footnotes at end of table.

TABLE 2—Continued
BURMA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Natural gas	million cubic meters	Total E&P Myanmar, 31.2%; Chevron Corp., 28.26%; PTT Exploration and Production Public Co. Ltd. (PTTEP), 25.5%; Myanma Oil and Gas Enterprise (MOGE), 15%	Yadana gasfield in Moattama, Gulf of Martaban	8,600.
Do.	do.	Petronas Carigali Myanmar Inc., 40.91%; Myanma Oil and Gas Enterprise (MOGE), 20.45%; PTT Exploration and Production Public Co. Ltd. (PTTEP), 19.32%; Nippon Oil Exploration (Myanmar) Ltd., 19.32%	Yetagun gasfield in Tanintharyi, Gulf of Martaban	4,600.
Do.	do.	Myanmar Petroleum Resources Ltd. and Myanma Oil and Gas Enterprise (MOGE)	Mann oilfield, south of Yangon, Yangon Region	40.
Do.	do.	Daewoo International, 51%; Oil and Natural Gas Corp. (ONGC) Videsh Ltd. of India, 17%; Myanmar Oil and Gas Enterprise (MOGE), 15%; Gas Authority of India (GAIL) Ltd. of India, 8.5%; Korea Gas Corp. (KOGAS), 8.5%	Shwe gasfield off of Rakhine State coast	4,125.
Do.	do.	Petroleum Authority of Thailand Exploration and Production International (PTTEP International), 80%; Myanma Oil and Gas Enterprise (MOGE), 20%	Zawtika Natural Gas Project (Gawthaka, Kakonna, and Zawtika offshore gasfields) in the Gulf of Martaban	3,100.
Nickel		China Nonferrous Metal Mining (Group) Co. Ltd. of China and Taiyuan Iron & Steel (Group) Co. Ltd. of China	Tagaung Taung nickel ore project (mine and smelter) at Thabeikying, Mandalay Region	25,000 (nickel), 85,000 (ferronickel).
Petroleum:				
Crude	thousand 42-gallon barrels	Myanmar Petroleum Resources Ltd. and Myanma Oil and Gas Enterprise (MOGE)	Mann oilfield, south of Yangon, Yangon Region	880.
Refined	do.	Myanma Petrochemical Enterprise (Government, 100%)	No. 1 refinery at Thanlyin (near Yangon)	7,300.
Do.	do.	do.	No. 2 refinery at Chauk, Magway Region	2,190.
Do.	do.	do.	No. 3 refinery at Thanbayakan	9,100.
Steel		Myanmar Posco Steel Co. Ltd. (POSCO, 70%, and Government, 20%)	POSCO Steel plant at Mingalardon Township, Yangon Region	30,000.
Tin, ore and concentrate		No. 2 Mining Enterprise	NA	NA.
Tungsten, ore and concentrate		No. 2 Mining Enterprise	NA	NA.
Zinc		No. 1 Mining Enterprise and Win Myint Mo Industrial Co. Ltd.	Namtu-Bawdwin lead-zinc mine located in Namtu Township, Kyaukme District in Northern Shan State	NA.

[e] Estimated. Do., do. Ditto. NA Not available.

THE MINERAL INDUSTRY OF CAMBODIA

By Yolanda Fong-Sam

In 2014, Cambodia produced cement, gravel, laterite, sand, and stone, which were mostly consumed domestically. According to the World Bank, in 2014, the nominal gross domestic product was $16.71 billion. Real growth was estimated to be 7.1%. The Asian Development Bank estimated that the industrial sector (which included mining) grew by 9.8%, and the construction sector saw an unspecified increase in business funded mainly by foreign direct investment (table 1; Asian Development Bank, 2015, p. 212; World Bank, The, 2015a, b).

In 2014, the National Bank of Cambodia reported that the country's total trade increased by 13% to $18.3 billion[1] from $16.2 billion in 2013. The country's exports were valued at $7.5 billion compared with $6.5 billion in 2013. In terms of imports, the total value in 2014 increased by 11.3% to $10.8 billion from $9.7 billion in 2013. Imports of petroleum were valued at $1.05 billion and represented 9.8% of the country's total import value. Cambodia's exports to the United States were valued at $2.85 billion. Imports from the United States had a total value of $327.9 million. Imports of aluminum and alumina, fertilizers, iron and steel products, and other nonferrous metals, nonmetallic minerals, petroleum products, and precious metals (not including gold) from the United States were valued at about $8.3 million, which represented 2.5% of total imports (National Bank of Cambodia, 2015, p. 8, 60; U.S. Census Bureau, 2015a, b).

According to the General Department of Mineral Resources of Cambodia, in 2013 (the latest year for which data were available), a total of 91 domestic and foreign companies (from Australia, China, Thailand, and Vietnam) held exploration licenses in the country for a total of 139 exploration projects. Minerals under exploration included antimony, bauxite, chromite, coal, copper, gold, iron, kaolin, and silica sand. Of the 91 companies, 13 (from China, 5; Thailand, 3; and domestic, 5) were licensed to develop mining projects for coal, gold, iron, limestone, and phosphate rock. The status of many of these projects was unknown (Royal Embassy of Cambodia to the United Kingdom, 2014, p. 14).

In July 2014, the Government announced that it had started the reconstruction of a cross-border railway between Cambodia and Thailand. The project included the reconstruction of a 43-meter (m)-long bridge close to the border with Thailand, and the construction of a 42-kilometer (km) railway between the towns of Sisophon and Poipet. An additional 6 km of rail was also planned for reconstruction that would reach the rail network of the State Railway of Thailand in Aranyaphrathet. The Governments of Cambodia and Thailand considered the upgrade of the railway system necessary to facilitate trade between their countries, which included the trade of mining and mineral goods. No further details were released in terms of costs and estimated date for commencement of the projects (Railway Gazette, 2014).

The demand for electricity generating capacity in Cambodia is projected to increase at a rapid pace—to about 1,650 megawatts (MW) in 2015; about 2,300 MW in 2018; and about 2,800 MW in 2020. To meet the demand, the Government developed a power expansion plan under the Power Development Plan for the Period 2008–20. Cambodia depended on electricity imports to meet its domestic needs; this lack of reliable electricity sources had been a challenge for investors interested in the mining sector. The Government expected to provide electricity to 100% of the villages in the country by 2020 and to about 70% of all rural areas by 2030 (Council for the Development of Cambodia, undated).

Production

In 2014, the production of commodities in the industrial minerals sector of Cambodia performed similarly to that of 2013, with slight increases in the production of gravel, sand, and stone, which were commodities mainly consumed by the construction industry. The production of cement was estimated to be about 1 million metric tons (Mt) in 2014 (table 1).

Structure of the Mineral Industry

In general, the mining sector in Cambodia is considered undeveloped, and most active mining operations consisted of small-scale quarries that produced industrial minerals to be used for construction, such as granite, gravel, laterite, limestone, marble, and sand. In addition, the mineral sector also consisted of artisanal and small-scale miners that seasonally run small operations to extract gold and gemstones. Because artisanal mining is done informally, output levels are difficult to determine. As of August 2014, mining extraction of precious minerals at an industrial scale was nonexistent in the country, although some companies had been granted exploration and mining licenses to mine these minerals (Open Development Cambodia, 2014).

Cambodia had only one active cement plant, Kampot Cement, which was located in Kampot Province. The plant was owned by Siam City Cement Co. of Thailand (90%) and Khaou Chuly Group (10%) and had a production capacity of 960,000 metric tons per year (t/yr).

Table 2 is a list of major mineral industry facilities in the country.

Commodity Review

Metals

Copper and Gold.—In December 2014, Angkor Gold Corp. of Canada received approval from the Ministry of Mines and Energy of Cambodia (MIME) to proceed with an environmental impact assessment for the company's gold mine project in Phum Syarung. The mining permit for the project covers an area of 12 square kilometers (km²) and included two prospects—the Blue Lizard and the Phum Syarung. The project was operated by Mesco Gold (Cambodia) Ltd., a subsidiary of Mesco Steel Ltd. of India. During 2015, Mesco planned to drill the Blue Lizard prospect to define its mineralization. Mesco also planned to move forward with the construction and development of the Phum Syarung prospect. According to the company, the feasibility of the prospect was determined by sample drilling the area; the company was not required to report on the identified resources, however, and no additional details were released. If approved, a mining license would be issued by the Cambodian Development Council and the Ministry of Environment to Mesco upon completion of the environmental impact statement, which would allow Mesco to start production. No timeline was released regarding completion of the study (Angkor Gold Corp., 2014).

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[1] Where necessary, values have been converted from Cambodian riel (KHR) to U.S. dollars (US$) at the rate of KHR4,036=US$1.00 for 2014 and KHR4,043=US$1.00 for 2013.

Brighton Mining Group of Australia held a joint interest (70%) in the Antrong gold project in Mondulkiri Province, which is located about 230 km northwest of Phnom Penh. The Antrong project includes three separate concessions—the Antrong, the Kang Roland North, and the Ropoah. The mineral license for the Antrong project was originally granted to Sun Hill Minerals of Cambodia for which Brighton held a 70% share. During 2014, the company carried several studies within the project, including geophysical studies, drill sampling, and trenching to test for gold anomalous zones. The company did not release details regarding the results of the studies. By the end of 2013, the company completed the construction of a road that would provide access to the Antrong project (Asia Miner News, 2014).

During 2014, Geopacific Resources Ltd. of Australia was exploring a potential copper-gold zone within the Kou Sa copper-gold project. The project was located in the Chep District of Phreah Vihear Province and consisted of an area of 158 km². In 2013, Geopacific conducted an exploration campaign, which included soil sampling, drilling, and soil geochemistry analysis that identified copper, copper-gold, and gold-molybdenum mineralization; however, the company had yet to outline the deposit's area and define reserves and resources. Geopacific's interest in the Kou Sa project was through Royal Australian Resources, which was Geopacific's subsidiary company in Cambodia. Royal Australian Resources had an option to acquire 100% tenement in the project; the company was owned by Geopacific (85%) and Geopacific's joint-venture partner Royal Group (15%) (BBY Ltd., 2014; Geopacific Resources Ltd., 2015).

In October 2014, Renaissance Minerals Ltd. of Australia announced the results of a scoping study for the development of an operation at its wholly owned Okvau deposit within the Okvau gold project. The Okvau Mine was projected to produce 1.5 million metric tons per year (Mt/yr) of ore. The project, which had an estimated cost of $133 million, is located in Mondulkiri Province approximately 265 km northeast of Phnom Penh and covers an area of approximately 400 km². The scoping study revealed the potential for the project to yield an average of 2,900 kilograms (kg) per year of gold (reported as 93,000 troy ounces per year) during an estimated mine life of 8 years. The Okvau deposit had an estimated mineral resource of 11 Mt at a grade of 2.3 grams per metric ton (g/t) gold for an estimated 24,700 kg of gold (reported as 794,000 troy ounces). Renaissance held a 100% interest in the Okvau exploration license through its 100%-owned subsidiary Renaissance Minerals (Cambodia) Ltd. (Renaissance Minerals Ltd., 2014).

Iron and Steel.—As of April 2014, no work had been done for the construction of the steel plant to be built in Preah Vihear Province in northern Cambodia. Plans included building a port in Koh Kong Province on the southwestern coast of the country and the construction of a 405-km-long railway to connect the steel plant to the seaport. The company in charge of building the railway portion of the project, the China Railway Group, stated that construction was expected to begin in 2013, but that the project was delayed owing to the inability to source funding. According to the Government of Cambodia, the signing of the construction contract took place in December 2013, although the project was announced in December 2012. The contract was valued at $11.2 billion, of which $9.6 billion was for the construction of the rail system and $1.6 billion was for the steel plant. The permits were granted to the lead developer, Cambodia Iron & Steel Mining Industry Group of China (CISMIG) (de Carteret, 2014; SB Wire, 2014).

Industrial Minerals

Cement.—In June 2014, Huaxin Cement Co. of China announced the acquisition of a 40% stake of the Chakrey Ting Factory Co. (owned by Cambodia Cement) at a cost of $24 million. The Chakrey plant, which was located in Kampot Province, was developed at a total cost of $100 million and had a projected production capacity of 1.1 Mt/yr of cement. The plant was still under construction in 2014 (FICO Cement, undated; Global Cement News, 2014).

Mineral Fuels

Petroleum and Natural Gas.—Cambodia had only one identified oil discovery, Block A, which covers an area of 4,709 km² in the Khmer Basin in the Gulf of Thailand. In October 2014, KrisEnergy Ltd. (registered in the Cayman Islands) announced the completion of the purchase of all share capital of Chevron Overseas Petroleum (Cambodia) Ltd. (COPCL) in Block A. In September, KrisEnergy received acknowledgment from the Government authorizing the company to finalize the transaction. COPCL held a 30% interest in Block A, which was transferred to KrisEnergy's wholly owned subsidiary KrisEnergy (Aspara) Ltd. [formerly known as KrisEnergy (Asia) Ltd.] in the transaction. After the completion of the purchase transaction, KrisEnergy's total interest in Block A added up to 55% (KrisEnergy Ltd., 2014).

In November 2014, the MIME announced the Government's plan to open concession bids for 19 onshore oil and gas exploration blocks located in the Gulf of Thailand, although no timeframe was given. In 2013, Cambodia was planning to build its first oil refinery on the southeastern coast of the country in Sihanoukville. The project was to be built jointly by

Petrochemical Co. of Cambodia and Sinomach China Perfect Machinery Industry Corp. of China at a cost of $2.3 billion. As of 2014, the project was expected to be delayed from its commencement projection of 2018 owing to unspecified changes in Cambodia's petroleum regulations (KrisEnergy Ltd., 2014; Thomson Reuters, 2014).

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TABLE 1
CAMBODIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons)

Commodity[2]	2010	2011	2012	2013[e]	2014[e]
Cement	789,025	906,711	980,000 [e]	1,000,000	1,000,000
Gravel	82,500	38,438	43,000 [e]	45,000	50,000
Laterite, blocks	1,612,500	355,000	412,500	415,000	415,000
Sand, construction material	38,367,500	8,296,590	8,800,000 [e]	8,800,000	9,000,000
Stone, crushed	6,331,000	5,223,345	5,850,000 [e]	5,850,000	6,000,000

[e] Estimated; estimated data are rounded to no more than three significant digits.

[1] Table includes data available through November 9, 2015.

[2] In addition to the commodities listed, clay, gemstones, gold, iron ore, limestone, and salt were presumably produced, but available information was inadequate to make reliable estimates of output.

Source: Cambodia's Ministry of Industry, Mines and Energy, General Department of Mineral Resources.

TABLE 2
CAMBODIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons)

Commodity	Main operating companies and main equity owners	Location of main facilities	Annual capacity[e]
Cement	Kampot Cement Co. Ltd. (Siam City Cement Co. of Thailand, 90%, and Khaou Chuly Group, 10%)	Phnom Tatung, Touk Meas District, Kampot Province	960
Gemstones	Jireh International Cambodia Construction and Import-Export Co. Ltd.	Anlong Krapeu-Preak Bey, Samlot District, Battambang Province	NA
Do.	Seoul Digem Cambodia Co. Ltd.	Lumphat District, Ratanakiri Province	NA
Do.	Sonuba Cham Industries Co. Ltd.	Phnom Trop, Pailin City	NA
Do.	Ultra Marine Kiri (Cambodia) Ltd.	Pating Thom Village, Ting Chak Commune, Borkeo District, Ratanakiri Province	NA
Do.	do.	Sen Chauv, Samlot District, Battambang Province	NA
Granite	TTY-Rithy Mexico Co. Ltd.	Svay Chreas District, Kracheh Province	NA
Limestone	Kampot Cement Co. Ltd. (Siam City Cement Co. of Thailand, 90%, and Khaou Chuly Group, 10%)	Phnom Tatung, Touk Meas District, Kampot Province	1,500
Do.	Thai Boon Roong Cement Co. Ltd.	Phnom Laang Laan Commune, Donghtung District, Kampot Province	NA
Do.	United International (Cambodia) Foreign Investment Group Co. Ltd.	East Touk Meas, Banteay Meas District, Kampot Province	NA

[e] Estimated. Do., do. Ditto. NA Not available.

THE MINERAL INDUSTRY OF CHINA

By Sean Xun

Economic growth in China beginning in the late 20th century has been the primary cause of the unprecedented global demand for minerals and metals in recent decades. China is estimated to have accounted for as much as 40% to 50% of global demand for mineral commodities during the past three decades as the country was undergoing a mineral- and metal-intensive stage in its economic development. To secure supplies of minerals and metals during this period, China increased its spending on exploration for domestic minerals, became the leading importer of many raw materials on the global market, and was an important investor in global mining assets. Beginning in 2012, China's economic growth slowed to about 7% to 8% annually from the previous double-digit rates of growth. This reduction in economic growth has been termed the "new normal," as the country's economy transforms from being investment and export driven (characterized by infrastructure development associated with urbanization) to being consumer driven (where sustainable growth is driven by domestic consumption). Accordingly, the mining and mineral-processing industries in China have encountered some challenges in recent years, such as underutilization of production capacity (International Council on Mining and Metals, 2012, p. 3; PricewaterhouseCoopers LLP, 2015, p. 3, 9).

In 2014, China invested $18.6 billion in mineral exploration, which represented a decrease of 5.4% compared with that of 2013. China's investment in mining of fuel and nonfuel minerals was $239 billion, which represented a year-on-year increase of 0.7% compared with a 10.9% increase from 2012 to 2013, and was the lowest rate of growth in the past 12 years. The outputs of natural gas, coal, and crude oil increased by 7.7%, 2.5%, and 0.7%, respectively, compared with those of 2013, and ranked China sixth, first, and fourth, respectively, in the world, in the production of those commodities, according to the Ministry of Land and Resources. The output of 10 nonferrous metals (aluminum, antimony, copper, lead, magnesium, mercury, nickel, tin, titanium, and zinc), gold, and crude steel increased by 7.4%, 5.5%, and 1.2%, respectively, compared with the outputs in 2013, and all ranked first in the world. The outputs of potash fertilizer, phosphate rock, and cement increased by 13.5%, 7.0%, and 2.3%, respectively, compared with those of 2013. In terms of value, the country's real gross domestic product (GDP) generated by the raw materials industry increased by 8.3% in 2014 compared with an increase of 10.3% in 2013, of which the contributions of the nonferrous metals, building materials, petrochemicals, and iron and steel industries increased by 11.4%, 9.6%, 7.2%, and 7.2%, respectively (table 1; Ministry of Industry and Information Technology, 2015a; Ministry of Land and Resources, 2015a, p. 1, 3–5, 9, 13–16).

Minerals in the National Economy

China's real GDP rate of growth was 7.3% in 2014 compared with 7.7% in 2013. The nominal GDP was about $10.3 trillion[1] in 2014. The major sectors that contributed to the GDP were industry (mining and manufacturing), which accounted for 35.9% of the total GDP; wholesale and retail trade (9.8%); agriculture, forestry, animal husbandry, and fisheries (9.5%); finance (7.3%); construction (7.0%); real estate (6.0%); and transportation, storage, and postal services (4.5%). In 2013 (the latest year for which data were available), mining and manufacturing accounted for 4.3% and 30.1%, respectively, of the GDP compared with 4.6% and 31.0% in 2012, and 5.1% and 31.8%, respectively, in 2010. The annual rates of growth of mining and manufacturing GDP from 2012 to 2013 were 1.5% and 6.8%, respectively, which were lower than the annual rate of growth for the general economy. The decrease in the mining and manufacturing sectors' share of the total GDP and the lower rates of growth of these two sectors compared with that of the overall economy reflect the country's economic transformation from an economy based upon infrastructure development and exports to one based upon domestic consumption. In 2014, the mining and manufacturing sectors employed about 6 million and 52 million people, respectively, which accounted for 3.2% and 28.7%, respectively, of the country's total urban employment. The average annual wages in mining and manufacturing were $10,027 and $8,352, respectively, compared with the national average annual wage of $9,164 (National Bureau of Statistics of China, 2015a–e).

As of 2014, the number of industrial enterprises above a designated size (enterprises with annual sales revenue of more than CNY20 million, or $3.2 million) was 377,888, of which 16,249, or 4.3%, were in mining and 352,365, or 93.2%, were in manufacturing. According to the National Bureau of Statistics of China, the total assets of industrial enterprises was $15.6 trillion, of which $1.54 trillion, or 9.8%, was in mining and $11.9 trillion, or 76.8%, was in manufacturing. The total revenue of industrial enterprises was $18.0 trillion, of which $1.1 trillion, or 5.8%, was in mining and $15.9 trillion, or 88.4%, was in manufacturing. The total profit of industrial enterprises was $1.1 trillion, of which $104 billion, or 9.5%, was in mining and $925 billion, or 83.5%, was in manufacturing. The ratio of profit to revenue was 9.9% for mining, 5.8% for manufacturing, and 6.1% for the overall industrial sector (National Bureau of Statistics of China, 2015u).

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[1] Where necessary, values have been converted from Chinese renminbi (CNY) to U.S. dollars (US$) at an annual average rate of CNY6.15=US$1.00 for 2014.

In 2014, according to the National Bureau of Statistics of China, the number of enterprises above a designated size that were engaged in the manufacture of nonmetallic mineral products was 33,993; the total revenue of these enterprises was $934 billion, with a profit-to-cost ratio of 7.74%. The number of enterprises above a designated size that were engaged in the manufacture of metal products was 20,784; the total revenue of these enterprises was $592 billion, with a profit-to-cost ratio of 6.27%. The number of enterprises above a designated size that were engaged in the smelting and pressing of ferrous metals was 10,363; the total revenue of these enterprises was $1.2 trillion, with a profit-to-cost ratio of 2.44%. The number of enterprises above a designated size that were engaged in the smelting and pressing of nonferrous metals was 7,385; the total revenue of these enterprises was $834 billion, with a profit-to-cost ratio of 3.29%. The number of industrial enterprises above a designated size that were engaged in the mining and washing of coal was 6,850; the total revenue of these enterprises was $493 billion, with a profit-to-cost ratio of 4.75%. The number of enterprises above a designated size that were engaged in the mining and processing of nonmetal ores was 3,758; the total revenue of these enterprises was $86 billion, with a profit-to-cost ratio of 8.6%. The number of enterprises above a designated size that were engaged in the mining and processing of ferrous metal ores was 3,312; the total revenue of these enterprises was $151 billion, with a profit-to-cost ratio of 10.04%. The number of enterprises above a designated size that were engaged in the mining and processing of nonferrous metal ores was 2,002; the total revenue of these enterprises was $102 billion, with a profit-to-cost ratio of 10.29%. The number of enterprises above a designated size that were engaged in support activities for mining was 166; the total revenue of these enterprises was $34 billion, with a profit-to-cost ratio of 2.57%. The number of enterprises above a designated size that were engaged in the extraction of petroleum and natural gas was 142; the total revenue of these enterprises was $186 billion, with a profit-to-cost ratio of 44.38%. The number of enterprises above a designated size that were engaged in the mining of other ores was 19; the total revenue of these enterprises was $390 million, with a profit-to-cost ratio of 6.45%. The average profit-to-cost ratio for the entire industrial sector was 6.25%. The relatively low profit-to-cost ratios of metal processing and of the coal industry were attributed to the low price of these commodities as well as overcapacity in these sectors (National Bureau of Statistics of China, 2015v).

In 2014, the total investment in fixed assets (excluding rural households) was $8.15 trillion, of which $2.7 trillion was invested in the manufacturing sector and $236 billion was invested in the mining sector. In the manufacturing sector, $1.4 trillion was invested in new construction projects, and $503 billion, in expansion projects. In the mining sector, $117 billion was invested in new construction projects, and $40 billion, in expansion projects. With respect to specific commodities, investment in the manufacturing of nonmetallic mineral products was $257 billion; manufacturing of metal products, $157 billion; smelting and pressing of nonferrous metals, $94 billion; smelting and pressing of ferrous metals, $78 billion; mining and washing of coal, $76 billion; extraction of petroleum and natural gas, $64 billion; mining and processing of nonmetal ores, $33 billion; mining and processing of ferrous metal ores, $27 billion; mining and processing of nonferrous metal ores, $27 billion; and support activities for mining, $8.3 billion (National Bureau of Statistics of China, 2015k).

As a result of investment in the mining and manufacturing sectors in 2014, annual production capacities increased in some subsectors, including the energy, ferrous metal, and nonferrous metal sectors, as follows: coal, with a newly added capacity of 295 million metric tons per year (Mt/yr) in 2014 compared with a capacity addition of 399 Mt/yr in 2013; coke, 50 Mt/yr compared with 67 Mt/yr in 2013; petroleum, 27 Mt/yr compared with 27 Mt/yr in 2013; natural gas, 15,700 million cubic meters per year compared with 14,600 million cubic meters per year in 2013; iron ore (gross weight), 133 Mt/yr compared with 237 Mt/yr in 2013; pig iron, 13 Mt/yr compared with 14 Mt/yr in 2013; crude steel, 22 Mt/yr compared with 25 Mt/yr in 2013; copper ore (gross weight), 23 Mt/yr compared with 44 Mt/yr in 2013; and alumina, 1.6 Mt/yr compared with 2.1 Mt/yr in 2013 (National Bureau of Statistics of China, 2015l).

Government Policies and Programs

On April 29, the Administrative Regulations for the Monitoring of the Geological Environment (The 59th Decree of the Ministry of Land and Resources, 2014) was issued by the Ministry of Land and Resources in accordance with the Mineral Resources Law, and the Regulations on the Prevention and Control of Geological Disasters and other applicable laws and regulations. The new regulations establish the purpose, basis, definition, principles, subjects, applicable scope, and legal liabilities for geologic environmental monitoring, which focuses on the effects of natural geologic processes and construction projects on the environment. The Regulations on the Administrative Penalties for Land and Resources (The 60th Decree of the Ministry of Land and Resources, 2014) was issued on May 7. The regulations establish the primary principles for applying executive restrictions to land and natural resource activities that are in violation of the Mineral Resources Law. Both the 59th and the 60th Decrees became effective on July 1 (Ministry of Land and Resources, 2014f; g).

On October 9, the State Administration of Taxation released the Notice on Implementing the Reform of Coal Resources Tax (CS [2014] No.72), the Notice on Adjusting the Policies of Crude Oil and Natural Gas Resources Tax (CS [2014] No. 73), and the Notice on Solving the Problems about Coal, Crude Oil and Natural Gas Charges Funds (CS [2014] No. 74). According to these notices, starting on December 1, 2014, the mineral resource compensation rate (a fee charged for mineral resource extraction) for coal, oil, and gas is reduced to zero and the resource tax on coal is to be charged based on sale price rather than volume. The range of the resource tax on coal is 2% to 10%, as determined by the local government. Some associated charges to the coal industry were removed. The applicable tax rate for crude oil and natural gas resources was raised from 5% to 6%. In 2014, China collected $3.2 billion in compensation fees for mineral resources, which was a decrease of 8.4% compared with the fees collected in 2013, and $17.6 billion in resource taxes, which was an increase of 7.8% compared with the resource tax revenue in 2013 (State Administration of Taxation, 2014a, b; Ministry of Finance, 2014; Ministry of Land and Resources, 2015a, p. 26).

In May, the Ministry of Land and Resources, together with the National Development and Reform Commission, the Ministry of Finance, the Ministry of Industry and Information Technology, the Ministry of Environmental Protection, and the Ministry of Commerce, initiated the third round of planning for exploration, exploitation, and use of mineral resources. The planning, which would be conducted at the Provincial, municipal, and county levels, sought to secure a mineral supply, improve processing and efficient use, and prevent environmental damage. The plan would use statistical data and indicators for the mineral industry in 2015 as a basis for establishing goals for 2020 and 2025 (Ministry of Land and Resources, 2014h).

On June 5, the Ministry of Land and Resources released the 2014 annual production quotas for rare-earth oxides (REOs) and tungsten ore. The production quota for REOs was 105,000 metric tons (t), of which heavy rare earths was 17,900 t and light rare earths was 87,100 t. The quotas for major light rare-earth mining regions included Inner Mongolia (59,500 t of REOs), Sichuan (25,000 t), and Shandong (2,600 t). The quotas for major heavy rare-earth mining regions included Jiangxi (9,000 t of REOs), Guangxi (2,500 t), Guangdong (2,200 t), Hunan and Fujian (2,000 t each), and Yunnan (200 t). The production quota for tungsten concentrate (65% WO_3 content) was 89,000 t, of which primary mining production was 71,000 t and byproduct recovery was 18,000 t. The quotas for major primary tungsten mining regions included Jiangxi (34,350 t of tungsten concentrate), Hunan (19,000 t), Yunnan (5,250 t), Guangdong (3,200 t), Fujian (2,500 t), and Guangxi (2,000 t). The quotas for major tungsten byproduct recovery regions included Henan (6,000 t of tungsten concentrate), Hunan (4,100 t), Jiangxi (3,400 t), Heilongjiang (1,100 t), and Guangxi (1,000 t). In 2014, the Ministry of Land and Resources did not issue antimony ore production quotas (Ministry of Land and Resources, 2014a, c).

As of yearend 2014, the national pilot program of green mines (environmentally friendly mines) construction included 661 mining companies. According to the Ministry of Land and Resources, these mines served as examples for the rest of mining industry in terms of circular economic development (sustainable development), efficient resource use, green technology application, and environmental protection. In 2014, the Ministry of Land and Resources released the Measures on the Acceptance Inspection of State-level Green Mine Pilots (Trial Implementation), and completed the evaluation of the progress of the first 37 pilot entities (Ministry of Land and Resources, 2015a, p. 19–20).

On December 31, the Ministry of Land and Resources released the minimum index requirements regarding the extraction recovery rate, concentration recovery rate, and comprehensive utilization rate for 8 minerals (asbestos, bauxite, chromite, graphite, manganese ore, molybdenum, pyrite, and tungsten); this brought the total number of minerals for which index requirements were released during the past 3 years to 20. The index requirements were established for specific types and grades of ores based on collective studies of industrial practice, and detailed testing and calculation procedures were provided. The requirements would be the minimum design standards for all new and expansion projects, and all existing facilities were required to meet these standards within 2 years (Ministry of Land and Resources, 2014b, 1, 11; 2014d).

In 2011, the Ministry of Industry and Information Technology, National Development and Reform Commission, Ministry of Supervision, Ministry of Finance, Ministry of Land and Environmental Protection, and other Government agencies had jointly issued the Notice on the Assessment and Implementation of the Program Aimed at Eliminating Outdated Production Capacity (the Ministry of Industry and Information Technology [2011] No. 46). According to the Ministry of Industry and Information Technology, in 2014 the program achieved its target and eliminated the following annual capacities: 4.86 gigawatts (GW) of electrical generating capacity, 230 million metric tons (Mt) of coal, 87.73 Mt of cement, 31.13 Mt of steel, 28.23 Mt of iron, 18.53 Mt of coke, 2.62 Mt of ferroalloys, 1.94 Mt of calcium carbide, 760,000 t of copper smelting, 510,000 t of electrolytic aluminum, 360,000 t of lead smelting, and 114,000 t of rare-earths separation capacity. In 2013, the following outdated annual production capacities were eliminated by the program: 5.44 GW of electrical generating capacity,, 145.78 Mt of coal, 105.78 Mt of cement, 24 Mt of coke, 8.84 Mt of steel, 6.18 Mt of iron, 2.1 Mt of ferroalloys, 1.18 Mt of calcium carbide, 960,000 t of lead smelting, 860,000 t of copper smelting, 270,000 t of electrolytic aluminum, and 190,000 t of zinc smelting (Ministry of Industry and Information Technology, 2011, 2014c, 2015b).

In May, the Bureau of Geological Survey inaugurated a national database for major minerals and mines in China. The database was established based on the results of a comprehensive survey and evaluation of the extraction recovery rate, concentration recovery rate, and comprehensive utilization rate at 16,061 important mineral mines. The minerals covered by the database included antimony, bauxite, coal, copper, fluorite, gold, graphite, iron, lead, manganese, molybdenum, natural gas, nickel, oil, phosphorus, potassium, pyrite, rare earths, tin, tungsten, and zinc. The database contained comprehensive information about the mines, including basic information about the mining enterprises, mineral reserves, technical conditions, extraction operations, beneficiation operations, use of coexisting minerals, waste treatment and use of tailings, economic indicators about the operations, and the application of new technologies. The database was expected to provide support for the evaluation of mine development and mineral use, and serve as a reference for mining research, policy, and planning for industry and Government agencies (Cao and Liu, 2014).

Production

In 2014, the output of iron ore (gross weight of crude ore) was 1.51 billion metric tons (Gt), which was an increase of 4% compared with that of 2013; crude steel, 822 Mt (an increase of 3%); and rolled steel, 1.13 Gt (an increase of 5%). The output of refined copper was 6.8 Mt in 2014, which was an increase of 10% compared with that of 2013, and primary aluminum, 28.3 Mt, which was an increase of 6.8%. In 2014, the output of gold was 486 t, which was an increase of 14% compared with that of 2013. China's production of crude steel and gold ranked first in the world.

China was the leading energy producing and consuming country in the world in 2014. Primary energy output totaled 3.6 Gt of standard coal equivalent (SCE), which was an increase of 0.5% compared with that of 2013. Energy consumption increased by 2% to 4.3 Gt of SCE in 2014, and the self-sufficiency rate was 84.5%. China's energy mix had changed continuously since 2011; the use of coal in total energy consumption was reduced and the share of natural gas and other clean fuels was increased. Coal production in 2014 totaled 3.9 Gt, which was a decrease of 2.2% compared with that of 2013. Crude oil production was 211 Mt (1.53 billion 42-gallon barrels) in 2014, which was an increase of 0.7% compared with that of 2013. The output of natural gas was 130 billion cubic meters in 2014, which was an increase of about 7% (Ministry of Land and Resources, 2015a, p. 14).

In 2014, the output of cement was 2.5 Gt which was an increase of 3% compared with that of 2013; potash fertilizer (100% K_2O), 6.1 Mt, which was an increase of 15%; and phosphate rock (30% P_2O_5), 120 Mt, which was an increase of 7% (table 1). Data on mineral production are in table 1.

Structure of the Mineral Industry

In China, the majority of the mining and processing activities were conducted by state-owned or state-holding enterprises. In 2014, state-owned and state-holding petroleum and natural gas extraction enterprises accounted for 87% of the total number of enterprises and 99% in terms of the total assets in the sector; support activities for mining, 42% and 97%, respectively; mining and processing of nonferrous metal ores, 21% and 64%, respectively; coal mining and washing, 20% and 87%, respectively; manufacturing of petroleum, coking coal, and the processing of nuclear fuel, 17% and 71%, respectively; smelting and pressing of nonferrous metals, 11% and 62%, respectively; mining and processing of nonmetal ores, 8% and 45%, respectively; manufacturing of nonmetallic mineral products, 7% and 33%, respectively; mining and processing of ferrous metal ores, 6% and 58%, respectively; smelting and pressing of ferrous metals, 5% and 71%, respectively; and manufacturing of metal products, 4% and 21%, respectively. The share of state ownership was high in the energy sector and relatively low in the downstream metal manufacturing sector, and the state-owned companies were mostly large in size, whereas private enterprises were small and distributed (National Bureau of Statistics of China, 2015w–x).

On February 19, China Petroleum & Chemical Corp. (Sinopec) announced that the company would start ownership reform by introducing social and private capital participation. It was the first attempt in the energy sector to shift from a monopoly state-owned enterprise to a mixed-ownership business. The proportion of private capital holdings would not exceed 30%. It was expected that more state-owned enterprises would follow Sinopec and diversify equity and develop mixed-ownership businesses (Xinhuanet.com, 2014a).

Mineral Trade

In 2014, the total value of exported goods was $2.34 trillion compared with $2.21 trillion in 2013. The value of mineral product exports accounted for 1.7% of total exports compared with 1.6% in 2013. Exports of base metals and the articles made of them accounted for 7.8% of the total compared with 7.1% in 2013. The country's exports to Asia accounted for 51% of total exports; Europe, 19%; North America, 18%; South America, 6%; Africa, 5%; and Oceania and the Pacific Islands, 2%. The share of these export destinations remained unchanged from 2013 (National Bureau of Statistics of China, 2015m, o).

In 2014, exports of rolled steel were valued at $70.8 billion compared with $53.2 billion in 2013; petroleum (refined products), $25.8 billion compared with about $24.5 billion in 2013; rolled aluminum, $11.9 billion compared with $10.4 billion in 2013; iron or copper nails and bolts, $5.2 billion compared with $4.7 billion in 2013; rolled copper, $4.2 billion compared with about $4.2 billion in 2013; unwrought copper and its alloys, $1.9 billion compared with $2.3 billion in 2013; coke and semicoke, $1.7 billion compared with $1.1 billion in 2013; unwrought aluminum and its alloys, $1.4 billion compared with $1.3 billion in 2013; cement and cement clinkers, $772 million compared with $796 million in 2013; coal, $695 million compared with $1.1 billion in 2013; and natural graphite, $298 million compared with $276 million in 2013. The rolled steel exports increased by 33% in terms of value, and by 50% in terms of the tonnage of output (from 62 Mt to 94 Mt) in 2014 compared with that of 2013. China became a net exporter of steel in recent years, and the increase in exports is likely to continue to increase owing to the overcapacity in China's steel industry (table 3; National Bureau of Statistics of China, 2015n, p).

In 2014, the total value of imported goods was $1.96 trillion compared with $1.95 trillion in 2013. The value of mineral product imports accounted for 23% of the total compared with 24% in 2013. Imports of base metals and the articles made of them accounted for about 5% of the total and remained unchanged from the percentage in 2013. Imports from Asia accounted for 55% of total imports; Europe, 17%; North America, 9%; and Africa, Oceania and Pacific Islands, and South America, 6% each. The percentage share of imports from these areas remained unchanged from that of 2013 (National Bureau of Statistics of China, 2015m, o).

Imports of crude oil amounted to $228 billion compared with $220 billion in 2013; iron ore, $94 billion compared with $106 billion in 2013; copper and copper alloys, $29.6 billion compared with $28.5 billion in 2013; petroleum (refined products), $23 billion compared with $32 billion in 2013; coal, $22 billion compared with $29 billion in 2013; copper ores, $21.6 billion compared with about $19.5 billion in 2013; rolled steel, $18 billion compared with $17 billion in 2013; rolled copper, $6.0 billion compared with $6.4 billion in 2013; rolled aluminum, $3.0 billion compared with $3.0 billion in 2013; manganese ores, $2.7 billion compared with $3.2 billion in 2013; potassium chloride, $2.5 billion compared with $2.4 billion in 2013; aluminum oxide, $1.9 billion compared with $1.4 billion in 2013; chromium ores, $1.8 billion compared with $2.4 billion in 2013; and compound fertilizers of nitrogen, phosphor and calcium, $640 million compared with $753 million in 2013 (table 4; National Bureau of Statistics of China, 2015n).

In 2014, the foreign direct investment (FDI) actually utilized in China was $120 billion, the same as that of 2013. In 2014, about 0.5% of the FDI was in the mining sector compared with 0.3% in 2013, and 33% was in the manufacturing sector compared with 38% in 2013. The number of projects financed by FDI was 35 for mining and 5,178 for manufacturing. The FDI in mineral-related activities was mainly in downstream processing rather than in mining and extraction (National Bureau of Statistics of China, 2015q, r).

In 2014, overseas direct investment (ODI) by China totaled $123 billion for the year compared with $108 billion in 2013. Hong Kong received $71 billion of China's ODI, followed by the United States, which received $7.6 billion. As of yearend 2014, the accumulated amount of China's ODI was $883 billion, of which Hong Kong had received $510 billion and the United States had received $38 billion. In 2014, about 13% of the ODI was in the mining sector compared with 23% in 2013, and 7.8% was in the manufacturing sector compared with 6.7% in 2013. As of yearend 2014, mining accounted for 14% of the accumulated amount of China's ODI, and manufacturing, 6% (National Bureau of Statistics of China, 2015s, t).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—Production of primary aluminum was 28.3 Mt in 2014 compared with 26.5 Mt in 2013. Owing to the low price of coal, the average cash cost (including tax) decreased by 9.8% from that of 2013 to $1,983 per metric ton. The number of electrolytic aluminum companies operating in China was 101, of which 26 companies had the capacity to produce more than 400,000 metric tons per year (t/yr) of aluminum. The total capacity of all producers was 35.84 million metric tons per year (Mt/yr). In 2014, 4.74 Mt/yr of capacity was added by new projects, 1.6 Mt/yr of capacity was recommissioned, and 3.35 Mt/yr of capacity was discontinued. About 39% of the new capacity was added in the Xinjiang Uygur Autonomous Region owing to its competitive electricity cost. Net imports were 180,000 t in 2014 compared with 260,000 t in 2013. Consumption of primary aluminum was estimated to be 28.0 Mt in 2014 compared with 25.0 Mt in 2013 (Yao, 2015, p. 8–10, 15, 19).

The leading consumer of primary aluminum in China was the construction sector, which accounted for 35.5% of total consumption, followed by electronics and electricity (14.0%), transportation (12.1%), exports of manufactured products (11.6%), and durable consumer goods (11.3%). The demand for aluminum depended mainly on growth in the automobile, electricity, and real estate sectors (Yao, 2015, p. 15–18).

Copper.—Production of copper concentrate (copper content) was 1.62 Mt in 2014 compared with 1.54 Mt (revised) in 2013. Production in five Provinces (Anhui, Gansu, Inner Mongolia, Jiangxi, and Yunnan) exceeded 100,000 t each in 2014. Imports of copper concentrate amounted to 3.07 Mt in 2014 compared with 4.26 Mt in 2013. Imports were sourced mainly from Chile, Mongolia, and Peru. Mongolia became the third-ranked import partner in 2014 after the Oyu Tolgoi copper mine started production. Total copper supply in the country amounted to 4.69 Mt compared with 4.26 Mt in 2013. Consumption of copper concentrate was estimated to be 4.46 Mt in 2014 compared with 3.97 Mt in 2013. The oversupply was estimated to be 221,000 t, which was less than the 294,000-t oversupply in 2013 (He, 2015, p. 8, 11).

Production of refined copper was 6.82 Mt in 2014 compared with 6.18 Mt (revised) in 2013. Production in six Provinces (Anhui, Gansu, Hubei, Jiangxi, Shandong, and Yunman) exceeded 400,000 t each in 2014. Imports of refined copper amounted to 3.58 Mt in 2014 compared with 3.20 Mt in 2013. Consumption of refined copper concentrate was estimated to be 8.72 Mt in 2014 compared with 8.20 Mt in 2013. The oversupply was estimated to be 1.42 Mt in 2014, which was more than the 892,000-t oversupply in 2013. New capacities added in 2014 were 650,000 t/yr for smelting and 900,000 t/yr for refining. As of yearend 2014, the total capacities for smelting and refining were 5.5 Mt/yr and 9.86 Mt/yr, respectively (He, 2015, p. 7, 13).

In 2014, consumption of refined copper in China was for electricity generation and transmission (which consumed 4.2 Mt of refined copper), air conditioning (1.36 Mt), transportation (855,000 t), electronics (625,000 t), construction (740,000 t), and others (890,000 t). Consumption for electricity generation and transmission and air conditioning increased by 7.6% and 9.7%, respectively, in 2014, compared with that of 2013 (He, 2015, p. 11).

On April 14, in order to reduce redundant construction in the copper industry, the Ministry of Industry and Information Technology issued Copper Smelting Industry Standard Conditions (Bulletin No. 29 of 2014), which established some minimum requirements for the copper industry. Smelting capacity must be 100,000 t/yr or more for new and reconstructed copper smelting facilities using concentrates and copper-bearing secondary resources. For existing copper smelting enterprises using copper-bearing secondary resources, the production capacity should be no less than 50,000 t/yr. Requirements for energy and water consumption per metric ton of copper production were also established (Ministry of Industry and Information Technology, 2014a, b).

On August 1, Glencore announced the completion of the sale of Las Bambas copper mine project to a Chinese consortium owned by MMG Ltd. (a subsidiary of China's state-owned company China Minmetals Corp.) (62.5%), Guoxin International Investment Corp. Ltd. (22.5%), and CITIC Metal Co., Ltd. (15.0%), effective July 31, 2014. The value of the transaction was approximately $7 billion. Las Bambas project, which is located at Cotabambas in the Apurimac Region of Peru, had the potential to be developed as an open pit mine and was expected to produce about 400,000 t/yr of copper and 5,000 t/yr of molybdenum. The project was at an advanced stage of construction and was scheduled to commence production in 2015 (Facing Finance, 2014; Glencore Xstrata plc, 2014; Ministerio de Energía y Minas, 2015, p. 108).

Iron Ore and Iron and Steel.—In 2014, production of iron ore amounted to 1.51 Gt (gross weight), which was an increase of 56.9 Mt, or 3.9%, compared with that of 2013. In December 2014, production was 126 Mt, which was a decrease of 4.6% compared with that of December 2013, and the third consecutive month of declining production compared with that of 2013. Imports increased to 933 Mt in 2014, or by 13.8% compared with those of 2013. In December 2014, imports were 86.9 Mt, which was an increase of 28.9% compared with those of December 2013. Dependence on foreign iron ore (metal content basis) increased to 78.5% in 2014 from 69.8% in 2013. Iron ore port stocks decreased slightly for 7 consecutive months after peaking in May. At yearend, port stocks were 98.24 Mt, representing an increase of 11 Mt compared with the beginning of the year. In 2014, iron ore prices maintained their overall downward trend. The annual average import price was $100 per metric ton, which was $29 per metric ton lower than that of 2013. The average import price was $75 per metric ton in December 2014, which was $4 per metric ton lower than that of December 2013 (China Iron and Steel Industry Association, 2015).

In 2014, production of manufactured steel amounted to 1.13 Gt; crude steel, 822 Mt; and pig iron, 714 Mt, representing increases of 5.4%, 5.6%, and 0.7%, respectively, compared with those of 2013. By comparison, the annual rate of growth for and manufactured steel, crude steel, and pig iron in 2013 was 11.4%, 7.5%, and 6.2%, respectively. The decreases were attributable to the lower rate of demand growth as the overall economy slowed. In 2014, China's crude steel production accounted for 50% of the world's total (China Iron and Steel Industry Association, 2015).

Exports of manufactured steel increased by 50.5% to 93.8 Mt in 2014 compared with that of 2013; imports of manufactured steel increased by 2.5% to 14.43 Mt. Net exports of crude steel equivalent were 84.4 Mt, which was an increase of about 33.1 Mt compared with that of 2013. By yearend 2014, China's total imports of manufactured steel since 1949 amounted to 594 Mt, whereas exports of manufactured steel amounted to 596 Mt. China became a net exporter of steel in 2006, and the volume of net exports had increased since 2009 (China Iron and Steel Industry Association, 2015).

In March, it was announced that the first "Chinese Iron Ore Long-term Development Plan" was in preparation and would be submitted to the State Council for approval by the end of 2014. The plan sought to decrease reliance on iron imports by increasing the share of domestic supply to more than 50%. New mine expansions, mergers, acquisitions, and other means would be adopted to improve industrial concentration and to accelerate industry restructuring and upgrading. About six to eight large mining groups with ore production capacities of more than 30 Mt/yr would be formed. On October 11, Anshan Iron and Steel Group Corp. announced the formation of the Anshan Iron and Steel Mining Group Co., which was the first domestic iron ore mining company with a capacity of more than 100 Mt/yr. The company held 11 Gt of iron ore reserves with the potential to reach 30 Gt in the future. As of yearend 2014, the mining and beneficiation capacities of the Anshan Iron and Steel Mining Group Co. were 400 Mt/yr and 120 Mt/yr, respectively (Anshan Iron and Steel Group Corp., 2014; Li, 2014).

Lead.—Production of lead concentrate was 2.80 Mt (lead content) in 2014 compared with 2.85 Mt (revised) in 2013. This was the first time in more than 10 years that lead concentrate production had decreased; the decrease was attributable to low lead prices and stricter environmental regulations. From January to November, the leading lead-concentrate-producing Province was Inner Mongolia (which produced 883,000 t of lead concentrate), followed by Hunan (405,000 t), Sichuan (241,000 t), and Guangxi (188,000 t). Imports of lead concentrate amounted to 900,000 t (metal content) in 2014 compared with 740,000 t in 2013. Consumption of lead concentrate was estimated to be 3.31 Mt in 2014 compared with 3.45 Mt in 2013. The oversupply was estimated to be 385,000 t, which was more than the 140,000-t oversupply in 2013 (Zhang, 2015, p. 11, 12, 14).

Production of refined lead was 4.74 Mt in 2014 compared with 4.78 Mt in 2013. The decrease was mainly attributable to the slow growth in demand, a shortage of raw material supply, and a shutdown of some capacities owing to low metal prices and facility upgrading to meet environmental regulations. From January to November, the leading refined-lead-producing Province was Henan (which produced 1.2 Mt of refined lead), followed by Hunan (1.1 Mt), Yunnan (416,000 t), and Hubei (304,000 t). Net exports of refined lead were 35,000 t in 2014 compared with 20,000 t in 2013. Major export partners included Malaysia, the Republic of Korea, Taiwan, Vietnam, and other countries in Southeast Asia. Consumption of refined lead was estimated to be 4.96 Mt in 2014 compared with 4.70 Mt in 2013. The supply shortfall was 255,000 t compared with an oversupply of 61,000 t in 2013 (Zhang, 2015, p. 17, 23).

The leading use of refined lead in China was for the production of lead-acid batteries, which accounted for 80% of total consumption. In 2014, the production of lead-acid batteries increased by 6.7%. Another major use was the production of mobile communications equipment, which increased by about 121% in 2014. These markets were expected to continue to grow in 2015 and to support a steady demand for refined lead (Zhang, 2015, p. 17–19).

Molybdenum.—In 2014, China's exports of molybdenum (molybdenum content in all products) increased by 59.4% to 22,795 t compared with that of 2013. The leading molybdenum export product, in terms of tonnage, was molybdenum concentrates (which totaled 7,863 t, representing an increase of 55.2% compared with that of 2013 and accounting for 34.5% of total exports in 2014); followed by molybdenum rod, bar, profile, and special profile (3,946 t, 46.9% increase, and 17.3% of the total); and molybdenum oxide (1,875 t, 96.3% increase, and 8.2% of the total). Other export products included ammonium molybdate (1,772 t), ferromolybdenum (1,558 t), and molybdenum powder (1,079 t). Total imports of molybdenum products amounted to 16,816 t, which was an 8.3% increase compared with that of 2013. Imports of molybdenum concentrate decreased by 48% to 5,182 t, accounting for 30.8% of total imports. Imports of molybdenum oxide and hydroxide were 743 t, accounting for 4.3% of the total (Tungsten & Molybdenum Monthly, 2015a).

On December 29, the Ministry of Commerce issued "2015 Export Quotas and Enterprises List for Tungsten, Antimony, Silver, Indium, Tin, and Other Metals." According to the document, export quotas for molybdenum and tungsten were canceled starting in 2015 and the export qualification requirements for molybdenum companies were also eliminated. The list of qualified tungsten export companies (other companies were not allowed to export their tungsten products) remained unchanged. The cancellation was an adjustment to the export tariffs and quotas on rare metals implemented in 2010 that sought to protect rare-metal resources by restricting exports. Some major consuming countries brought this trade-restriction issue to the World Trade Organization (WTO), which ruled in October 2014 against China. The lifting of export restrictions on molybdenum was expected to have limited effect on export quantities in the short term because, during the past 2 years, the actual exports accounted for only 60% to 70% of the quotas (Zhu, 2014).

China Molybdenum Co. Ltd. (also known as Luoyang Luanchuan Molybdenum Industry Group Co. Ltd.) was one of the world's leading producers of molybdenum. In 2014, the company operated the Luanchuan molybdenum-tungsten mine, which was located at Luanchuan, Henan Province. As of yearend 2014, the proven and probable reserves were estimated to be 321 Mt of ore at a grade of 0.11% molybdenum and 0.11% WO_3. The molybdenum metal content was estimated to be about 333,000 t, and the WO_3 content, about 381,000 t. The company had a molybdenum mining capacity of 30,000 metric tons per day (t/d), ferromolybdenum smelting capacity of 25,000 t/yr, and molybdenum roasting capacity of 40,000 t/yr. According to the company, these capacities were all ranked first in the country. In 2014, the production of molybdenum (metal content) was 16,270 t, and the molybdenum recovery rate was 85.3% (China Molybdenum Co., Ltd., 2015a, p. 12; 2015b, p. 12, 33).

Tin.—Production of tin concentrate was 99,000 t (metal content) in 2014 compared with 97,000 t (revised) in 2013. Imports of tin concentrate were estimated to be 17,000 t (metal content) in 2014 compared with 13,500 t in 2013. Major import partners were Bolivia, Burma, the Democratic Republic of the Congo [Congo (Kinshasa)], and Tanzania. Bolivia was the leading import source before 2013. In 2014, Burma became the leading import source, accounting for 97.22% of imports by gross volume. Metal content in Burma's tin concentrate was relatively low compared with other sources. The considerable increase in tin concentrate imports was an indicator of the shortage of domestic raw material supply (Sun, 2015, p. 8).

Production of refined tin was 187,000 t in 2014 compared with 159,000 t (revised) in 2013. From January to November, the leading refined-tin-producing Province was Yunnan, which produced 89,106 t of refined tin, followed by Hunan (42,537 t), Jiangxi (19,642 t), and Guangxi (13,192 t). Imports of refined tin were 7,000 t in 2014 compared with 13,000 t in 2013. The decrease was owing mainly to the lower domestic price compared with the international market price. Imports from Indonesia decreased by 67% to 2,147 t, which was attributable to the export ban on certain grades of refined tin that was implemented in 2013 by the Government of Indonesia. Imports from Bolivia remained at 3,000 t, which was unchanged in recent years. Exports decreased by 59.4% to 941 t. Consumption of refined tin was estimated to be 161,000 t in 2014 compared with 156,000 t in 2013, accounting for 46% of world consumption. In 2014, the rate of growth of production was higher than the rate of growth of consumption and the surplus of refined tin increased compared with that of 2013 (Sun, 2015, p. 8–10, 12, 15).

The leading use of refined tin in China was to produce solder, which accounted for 61% of total consumption, followed by tin chemicals (16%), tin plate (11%), copper alloy (4%), lead-acid batteries (4%), and others (4%). Solder was used by the electronics and information industries, which experienced a high rate of growth in China during past 10 years. The markets for lead-acid batteries and tin chemicals were experiencing steady rates of growth. In 2014, consumption of tin plate increased by 6% to 16,000 t compared with that of 2013 (Sun, 2015, p. 14–16).

Tungsten.—Production of tungsten concentrates (65% WO_3) was 71,000 t (tungsten content) in 2014 compared with 71,000 t (revised) in 2013. The leading producers included China Molybdenum Co., Ltd. in Henan (which produced 12,343 t of tungsten concentrates), Jiangxi Tungsten Industry Group Co., Ltd. in Jiangxi (11,000 t), Shizhuyuan Tungsten Mine in Hunan (5,357 t), Jiangxi Rare Earth and Rare Metals Tungsten Group Corp. in Jiangxi (4,410 t), Chongyi Zhangyuan Tungsten Co., Ltd. in Jiangxi (4,100 t), and Xianglu Mountain Tungsten Mine in Jiangxi (4,000 t) (Tungsten & Molybdenum Monthly, 2015b).

Imports of tungsten concentrates amounted to 3,327 t. The leading importing Provinces were Fujian (which imported 2,462 t of tungsten concentrate), Inner Mongolia (366 t), and Tianjin (166 t). The sources of tungsten imports were Brazil, Canada, Mongolia, Nigeria, Russia, Rwanda, Vietnam, and others. The leading importing companies were Xiamen Jialu Metals Industry Co., Ltd. (which imported 73% of total tungsten concentrate imports); T&B International Logistics Group; Erenhot Yuantonneg Trade Co., Ltd.; Erenhot Yangguang Trade Co., Ltd.; and Zhuzhou Keneng New Material Co., Ltd. Imports of sodium tungstate increased by about 1,900% to 410 t compared with that of 2013. Unwrought sodium tungstate was mainly imported from Vietnam for ammonium paratungstate (APT) production (Tungsten & Molybdenum Monthly, 2015b).

Exports of tungsten products increased by 12.7% to 20,467 t compared with that of 2013 owing to increased foreign demand for tungsten and declining stocks in other countries. The major exported products included yellow tungsten dioxide (3,617 t, which was an increase of 18.2% compared with the amount exported in 2013), blue tungsten dioxide (3,255 t, 18.5%), APT (2,119 t, 8%), ammonium metatungstate (1,326 t, 2.8%), tungsten carbide powder (961 t, 45.18%), and ferrotungsten (342 t, 529%) (Tungsten & Molybdenum Monthly, 2015b).

Total tungsten metal consumption (excluding the consumption of recycled tungsten) increased by 2.4% to 34,000 t in 2014 compared with that of 2013, of which 20,400 t (4% increase from 2013) was used for cemented carbide, and 10,534 t (1% increase from 2013) was consumed by the specialty steel sector (Tungsten & Molybdenum Monthly, 2015b).

Zinc.—Production of zinc concentrate was 4.93 Mt (zinc content) in 2014 compared with 4.73 Mt (revised) in 2013.

The leading zinc-concentrate-producing Provinces included Inner Mongolia (1.2 Mt), Hunan (666,000 t), Yunnan (643,000 t), Guangxi (473,000 t), Shanxi (450,000 t), and Sichuan (370,000 t). The production in Inner Mongolia increased by 16.5% compared with that of 2013. Imports of zinc concentrate were estimated to be 940,000 t (zinc content) in 2014 compared with 890,000 t in 2013. Major import partners were Australia, Mongolia, and Peru. The average zinc content of imported zinc concentrate was 45% to 47% (Fan, 2015, p. 11–12, 16).

Production of refined zinc was 5.6 Mt in 2014 compared with 5.2 Mt in 2013. The increase was mainly attributable to the improvement in the metal price since June. In the second half of 2014, all large facilities in China operated at full capacity, and medium and small facilities operated at 80% or more of their designed capacity. The leading refined-zinc-producing Provinces included Hunan (1.2 Mt), Yunnan (1.1 Mt), Shanxi (832,000 t), Inner Mongolia (530,000 t), and Guangxi (483,000 t). Net imports of refined zinc were 620,000 t in 2014 compared with 640,000 t in 2013. Consumption of refined zinc was estimated to be 6.25 Mt in 2014 compared with 5.96 Mt in 2013. The supply and demand of refined zinc were in balance in 2014. Based on the demand for refined zinc and domestic mine output in recent years, China would need to import an estimated 1 Mt of zinc (in the form of refined zinc or zinc concentrate) every year to maintain the balance (Fan, 2015, p. 13–14, 17).

The leading use of refined zinc in China was galvanization, which accounted for 55% of total consumption, followed by die-casting alloy (25.8%), zinc oxide (9.2%), brass (5.7%), and batteries (3.9%). Galvanization was the fastest growing use with an annual rate of growth of 10.2% during the past 3 years owing to the increase in galvanized steel production in China. The annual rate of growth for zinc oxide consumption was 9.0% during the past 3 years owing to the increase in automobile tire production. Consumption in other industries was slow or declining (Fan, 2015, p. 14–16).

Industrial Minerals

Cement.—In 2014, the rate of growth of investment in real estate development was 11.9% compared with 19.8% in 2013. China's fixed asset investment growth rate was 15.8% compared with 19.9% in 2013. The fixed asset investment rate of growth in 2014 was the lowest in 10 years, which led to a sharp decline in demand for cement. The rate of growth in infrastructure investment, however, remained high at more than 20%, which helped to maintain the demand for cement. In 2014, the annual rate of growth of cement output was 2%, which was the lowest rate of growth since 1991 (table 1; Digital Cement, 2015).

In 2014, cement production in Jiangsu Province was 190 Mt, which was ranked first in the country, followed by Henan and Shandong Provinces, which had outputs of more than 150 Mt each. Guangdong Province also had a high level of output and rate of growth, and shifted in rank from fifth in 2013 to fourth in 2014. Cement production in Guizhou Province increased by 17% in 2014, which ranked the Province first in the country in terms of rate of growth in cement production for 4 consecutive years. Production in 14 Provinces maintained single-digit growth, and 13 Provinces had production decreases. The decline in production was fastest in Hebei Province; where cement production had decreased for 3 consecutive years (Digital Cement, 2015).

In 2014, investment in the cement industry decreased 16% compared with that of 2013. The investment had declined for 4 consecutive years since 2011. The decline was attributable to weak demand owing to the decreasing rate of growth of fixed asset investment as well as production overcapacity. Despite the decreased investment, 54 cement clinker production lines came online in 2014, adding a total of 70.3 Mt /yr of production capacity, which was 24 Mt/yr less (or a 25% decrease) than the capacity addition in 2013. Of the 54 new clinker production lines, 31 lines had a clinker production capacity of 5,000 t/d; 17 lines had a clinker production capacity of 2,500 to 4,000 t/d, 2 lines had a clinker production capacity of 2,000 t/d, and 4 lines had a clinker production capacity of less than 2,000 t/d. The average capacity of these 54 lines was 4,200 t/d. New capacity was mainly in Guizhou and Yunnan Provinces. In total, 25 Mt/yr of new capacity was added in these two Provinces, which accounted for 36% of the country's added capacity (Chen, Bolin, 2015; Digital Cement, 2015).

By the end of 2014, the total number of cement production lines that used the dry process was 1,758 (including discontinued but operational capacity), with total production capacity of 1.77 billion metric tons per year. The production capacity increase in 2014 accounted for about 4% of total capacity, whereas overall consumption increased by only about 2%, making the supply and demand situation more challenging in 2014 (Chen, Bolin, 2015; Digital Cement, 2015).

China Building Materials Group Co., Ltd. was a state-owned building materials company. By the end of 2014, the company's cement production capacity was 400 Mt/yr, which was about 40 times higher than that in 2006 (11 Mt/yr) and ranked the company first in the world in terms of capacity in 2014. In the same time period, the company's concrete production capacity increased from zero to 413 million cubic meters, which also ranked the company first in the world in 2014. The company's gypsum board production capacity increased to 1.78 billion square meters in 2014 from 360 million square meters in 2006 which ranked the company first in Asia in 2014. In 2014, the company sold 292 Mt of cement compared with 285 Mt in 2013, and 87 million cubic meters of concrete, which was the same as that of 2013 (China Building Materials Group Co. Ltd., 2015a, p. 2, 15–16; 2015b).

Graphite.—In 2013, natural graphite production in China was 810,000 t, accounting for 68% of global production. In 2014, the country's natural graphite production was estimated to be 780,000 t. China was the world's leading consumer of graphite, accounting for 50% of global consumption. In China, crystalline graphite was mainly used in steel metallurgy and refractory materials, accounting for 40% of the total consumption, followed by the foundry industry (20%), and other applications, such as forging colloidal graphite, drawing colloidal graphite, and energy-saving additives. China's annual graphite exports in terms of tonnage accounted for 80% of total world graphite exports, and its major export partners were Germany, Japan, the Republic of Korea, and the United States.

Japan was the world's leading importer of graphite, and 98% of its graphite imports were from China. The United States was completely dependent on imports of natural flake graphite, of which 48% came from China (Liu, 2015).

In recent years, graphite had been deemed a strategic resource that had broad aerospace, electronics, military, and nuclear power applications. It is a raw material for graphene, which has unique material properties for high-tech applications. In recent years, the Government had issued a series of policies that sought to develop downstream processing technology and value-added products for graphite. In November, the National Development and Reform Commission, the Ministry of Finance, and the Ministry of Industry and Information Technology jointly issued the "Key Material Upgrading Project Implementation Plan," which identified graphene as one of the strategic materials for which the Government intended to achieve commercial production and applications by 2016 (Ministry of Industry and Information Technology, 2014d, p. 1–3; Liu, 2015).

Potash.—On January 10, the Lop Nur Salt Lake 1.2-Mt/yr potassium sulfate technology research and development project was awarded the National Science and Technology Progress Prize. The project was operated by Xinjiang Lop Nur Potassic Salt Scientific and Technology Development Co., which had produced 3.55 Mt of potash since 2011. The potassium hydroxide content in the product was 51.9%, and the recovery rate was 57.5%. The production accounted for more than 78% of the domestic market share (China Chemical Industry Group, 2014).

Improving agricultural yields are important to China owing to the country's relatively limited amount of arable land—China has 9% of the world's arable land and 20% of the world's population. Use of fertilizer has increased the agriculture yields in the country by 50%. China was the second-ranked consumer of potash in the world. Annual imports of potash totaled about 6 Mt. The Lop Nur project increased China's potash self-sufficiency rate from 30% to more than 50%. The technologies and equipment developed at the Lop Nur project were expected to be applied at other domestic and foreign sulfate salt lakes (China Chemical Industry Group, 2014).

Rare Earths.—China was the world's leading rare-earth producer, consumer, and exporter in 2014. As of yearend 2014, 21 mining companies and more than 100 processing companies were registered under the Ministry of Industry and Information Technology for a total rare-earth mining capacity of about 300,000 t/yr and a total rare-metal production capacity of about 60,000 t/yr. In addition, secondary rare-earth products were also produced from waste materials by some recycling companies (State Council, 2012, p. 1–6; Chen, Zhanheng, 2015).

In January, the State Council approved the rare-earth industry integration plan that was prepared by the Ministry of Industry and Information Technology and other agencies. According to the plan, six large rare-earth companies would be formed to integrate the rare-earth industry and improve the industry's international competitiveness. The six companies were Aluminum Corporation of China Ltd. (Chinalco), which would integrate rare-earth enterprises in Guangxi, Jiangsu, Shandong, and Sichuan; Baogang Group, which would integrate rare-earth enterprises in Gansu and Inner Mongolia; China Minmetals Corp., which would integrate rare-earth enterprises in Hunan, although it also had enterprises in Fujian, Guangdong, Jiangxi, and Yunnan; Ganzhou Mining Group, which would integrate rare-earth enterprises in Jiangxi; Guangdong Rising Nonferrous Group, which would integrate rare-earth enterprises in Guangdong; and Xiamen Tungsten Group, which would integrate rare-earth enterprises in Fujian. According to the plan, a series of policies, such as production quotas, mandatory regulations, and new mining and permitting processes would be issued to support the operation of these companies. The formation of these large enterprises in the rare-earth industry was expected to improve the efficiency of resource utilization in the industry as well as the effectiveness of policy implementation by the Government (Xinhuanet.com, 2014b; Chen, Zhanheng, 2015).

In 2014, China's rare-earth exports had a gross weight of 27,729 t (with a rare-earth-oxide-equivalent content of about 80% to 90%) and an average price of $13.4 per kilogram compared with 22,493 t at an average price of $25.50 per kilogram in 2013. From 2009 to 2014, the tonnage of exports peaked at 39,813 t in 2010 (average price $23.60 per kilogram), and the average export price peaked at $158.21 per kilogram in 2011 (gross weight of 16,860 t). In 2014, the leading export partners, in terms of export tonnage, were Japan (which received 45% of China's rare-earth exports), the United States (33%), the countries of the European Union (14%), and others (8%). In terms of export value, the leading export partners were Japan (which received 47% of China's rare-earth exports), the United States (21%), the countries of the European Union (14%), and others (18%). The leading rare-earth elements exported were lanthanum and cerium, which accounted for 52% and 25%, respectively, of the total export tonnage, and 24% and 11%, respectively, of the total export value. The price peak observed in 2011 was owing to an export quota placed on rare-earth exports by the Government; this quota was subsequently challenged by export partners at the WTO. On March 26, 2014, a WTO panel issued a ruling stating that the rare-earth export quotas applied by the Chinese Government were in violation of WTO rules and commitments. On April 17, China's Ministry of Commerce submitted a formal appeal to the WTO appellate body, and on August 7, the WTO appellate body issued its final ruling, which was against China's position. In compliance with the verdict, on December 31, the Ministry of Commerce and the General Administration of Customs announced that the removal of the rare-earth export quotas would take effect on January 1, 2015 (Chen, Zhanheng, 2015; China Rare Earth Industry Association, 2015).

Mineral Fuels and Related Materials

Coal.—In 2014, China's energy output, including coal, natural gas, petroleum, primary electricity, and other energy, amounted to 3.6 Gt of standard coal equivalent (SCE), which was a 0.3% increase compared with that of 2013. Consumption of energy amounted to 4.17 Gt of SCE, which was a 2.1% increase compared with that of 2013. In 2014, output of coal accounted for 73.2% of the country's total energy output compared with 75.4% in 2013. From 1978 to 2014, coal's share of the energy output was in the range of 70% to 78%, and from 2011 to 2014, decreased gradually to 73.2% from 77.8%. Coal accounted for 66% of total energy consumption in 2014 compared with 67.4% in 2013. The share was in the range of 66% to 76% from 1978 to 2014; the maximum share was reached in the early to mid-1990s, and a gradual decrease (about 1% each year) took place from 2011 to 2014. The decrease in coal output and consumption was attributable to China's strategic decision to mitigate environmental effects by reducing high-emission and high-pollution energy. In the Energy Development Strategy Action Plan (2014–2020), which was issued by the State Council on June 7, the consumption of coal would continue to decrease to less than 62% by 2020. The approaches proposed in the plan included eliminating outdated production capacity in high-energy-consuming industries and developing natural gas and nonfossil-fuel energy supplies as coal substitutes (State Council, 2014; National Bureau of Statistics of China, 2015i, j).

In 2014, coal output in China decreased for the first time in 14 years. The profits of coal enterprises above a designated size totaled $18 billion, which was a decrease of 44.4% compared with that of 2013. About 70% of the coal enterprises had losses in 2014, and the total losses amounted to $11.1 billion, which was an increase of 61.6% compared with that of 2013. Annual coal exports were 5.74 Mt, which was a decrease of 23.5% compared with losses in 2013. China's coal production capacity exceeded 4 Gt in 2014, and about 10 Mt of capacity was under construction. China's annual net imports of coal were more than 200 Mt for 4 consecutive years since 2011, which accounted for about 8% of domestic coal consumption. Owing to the overcapacity of the global coal market, coal imports are expected to remain high. On the other hand, demand was expected to continue to decrease as China's economic growth slows further, and the Government continued to implement its strategic plans to reduce coal as a primary source of energy production, reduce energy consumption per unit of GDP, and reduce emissions and other pollutants (Ministry of Land and Resources, 2015b).

Natural Gas.—In 2014, output of natural gas accounted for 4.8% of total energy output in China compared with 4.4% in 2013. From 1978 to 2014, natural gas' share of energy output was in the range of 1.9% to 4.8%, and showed a general increasing trend. Natural gas accounted for 5.7% of total energy consumption in 2014 compared with 5.3% in 2013. From 1978 to 2014, the share of natural gas in the country's total energy output was in the range of 1.8% to 5.7%, and showed a gradual increase from 1998 (1.8%) to 2014. The increase in natural gas output and consumption was attributable to China's strategic decision to promote low-emission energy. In the Energy Development Strategy Action Plan (2014–2020), the consumption of natural gas would continue to increase to more than 10% of energy consumption by 2020. The approaches outlined in the plan included developing natural gas transportation systems and expanding natural gas imports. According to the plan, natural gas would be supplied to all urban residents by 2020 (State Council, 2014; National Bureau of Statistics of China, 2015i, j).

On September 13, China National Petroleum Corp. announced that it had started the construction of the China-Central Asia gas pipeline D line segment. The total length of this pipeline would be 1,000 kilometers (km), of which 840 km would be in Kyrgyzstan and Tajikistan. The designed annual transportation capacity was 30 billion cubic meters. Gas would be sourced from gasfields in Turkmenistan. This pipeline, together with pipelines A, B, and C that connected Turkmenistan, Uzbekistan, and Kazakhstan, would form a China-Central Asia gas pipeline network. The network was expected to improve the cooperation between China and Central Asian countries. As of September 1, the China-Central Asia gas pipelines A, B, and C had transported 19.1 billion cubic meters of gas to China in 2014, and 95 billion cubic meters in total since the pipelines started operation. After completion of pipeline D, the total capacity of the China-Central Asia gas pipeline network would be 85 billion cubic meters (China National Petroleum Corp., 2014b).

On September 15, China National Offshore Oil Corp. announced that high-yield gas flow was obtained at its deepwater Offshore Oil 981 rig (in Lingshui 17–2 gasfield) in the northern South China Sea. This was the first major independent discovery of a deepwater oil and gas field by a Chinese company. The Lingshui 17–2 gasfield is located in the Lingshui Nanhai Qiong Basin, 150 km from Hainan Island. The average water depth at the operation is 1,500 meters. The gas flow was 1.6 million cubic meters per day. The South China Sea is a highly prospective area for oil and gas, and deepsea reserves were estimated to account for 70% of the reserves. The discovery of the Lingshui 17–2 gasfield was expected to facilitate efforts to exploit the potential for oil and gas production in the region (China National Offshore Oil Corp., 2014).

In March, China Petrochemical Corp. announced that its Fuling shale gasfield would advance to commercial development and that a facility with a production capacity of 5 billion cubic meters would be built by 2015. This would be the first shale gas operation in China. The reserves at the Fuling shale gasfield were estimated to be 107 billion cubic meters. As of October 29, about 1 billion cubic meters of shale gas had been produced at the Fuling shale gasfield since the first well started production on January 9, 2013. China's technically recoverable shale gas resources were estimated to be 31.5 trillion cubic meters, which would make them the largest in the world and almost two times those of the United States. Shale gas exploration and development was identified as a strategic emerging industry by the Government (U.S. Energy Information Administration, 2013; China Petrochemical Corp., 2014).

On May 21, China National Petroleum Corp. and Public Joint Stock Company Gazprom of Russia signed the Sino-Russian East Natural Gas Pipeline Project Cooperation Contract. Under the contract, Russia would begin to supply natural gas to China in 2018 through the eastern natural gas pipeline between China and Russia, and the volume of gas would increase year by year during the first 5 years, and would reach 38 billion cubic meters per year in the sixth year. Natural gas would be sourced mainly from the Chayandin and the Kovyktin gasfields of eastern Siberia in Russia (China National Petroleum Corp., 2014a).

Petroleum.—In 2014, the output of crude oil accounted for 8.4% of total energy output in China, which was the same as in 2013. Crude oil's share of energy output was 23.7% in 1978, and it had gradually decreased since then. It remained at 8.4% from 2011 to 2014. The consumption of crude oil accounted for 17.1% of total energy consumption in 2014, which was the same as that of 2013. From 1978 to 2014, crude oil's share of energy consumption was in the range of 16.6% to 22.7%, and remained at 17% from 2007 to 2014. The relatively unchanged output was attributable to the depletion of old oilfields in eastern areas, such as the Songliao Basin and the Bohai Bay Basin, although some new fields had been developed in western areas, such as the Tarim Basin, the Ordos Basin, the Junggar Basin, and the Qaidam Basin. In the Energy Development Strategy Action Plan (2014–2020), some approaches were outlined to increase crude oil output, which included consolidation of existing oilfields; development of low-grade resources; application of advanced oil recovery technology; and exploration and development of offshore oil and gas in the Bohai Sea, the East China Sea, and the South China Sea (State Council, 2014; National Bureau of Statistics of China, 2015i, j).

Uranium.—In December, Tianshan Uranium Co. completed phase I construction and started trial production at the Mengqiguer uranium mine in Xinjiang. The designed production capacity was 500 t/yr of uranium content. Phase II of the project had started construction and would have a production capacity of 1,000 t/yr of uranium content. The resources discovered in China since 2000 were more than the total resources discovered in the 45 years prior to 2000. As of October, China had invested $737 million in overseas uranium projects in Mongolia, Namibia, Niger, and Zimbabwe, and owned 86,000 t of reserves (in terms of contained U) and 850 t/yr of production capacity. On January 21, China National Nuclear Corp. (CNNC) signed an agreement with Paladin Energy of Australia to purchase a 25% stake in the Langer Heinrich uranium mine in Namibia for $190 million. Under the agreement, CNNC would be able to buy 25% of production, which was about 550 t/yr, at spot market prices. According to China's Energy Development Strategy Action Plan (2014–2020), installed nuclear power capacity would be 58,000 GW and the capacity under construction would be 30,000 GW in 2020, which would generate strong demand for nuclear fuels (Chen, 2014, p. 34; Komnenic, 2014; Ministry of Land and Resources, 2014e; State Council, 2014).

Reserves and Resources

According to the Ministry of Land and Resources, the number of newly discovered deposits totaled to 249, including those of such major minerals as bauxite, coal, crude oil, gold, manganese ore, molybdenum, natural gas, shale gas, and tungsten. Of 45 major minerals, the resources of 36 increased in 2014, those of 5 decreased, and those of 4 remained unchanged. The resources of shale gas were reported for the first time in 2014 (Ministry of Land and Resources, 2015a, p. 3–5).

On January 20, the Geological Survey of Shaanxi Province announced that a large niobium-rubidium-tantalum deposit was identified in southeastern Shaanxi Province. The deposit was estimated to contain 300,000 t of niobium-tantalum reserves, and 80,000 t of rubidium. Another large rare-metal deposit had been discovered at Baicheng in southern Xinjiang. The reserves at the Baicheng deposit were estimated to be 100,000 t of niobium and 10,000 t of tantalum. Other metals, such as hafnium and rare-earth elements, were also identified at the deposit. The Chinese system for reporting reserves uses the term "basic reserves," which is roughly equivalent to the term "reserves" as used by the U.S. Geological Survey (Cui, 2009; Hou, Tang, and Yang, 2014).

As of 2014, China's proven and probable bauxite (ore) reserves were estimated to be 983 Mt, which is the same as in 2013. The reserve level was in the range of 730 Mt to 1.1 Gt from 2005 to 2014. The leading regions for bauxite reserves were Guangxi (which had 466 Mt of proven and probable bauxite reserves), Henan (149 Mt), Shanxi (145 Mt), Guizhou (133 Mt), Chongqing (64 Mt), Yunnan (15 Mt), Hubei (5 Mt), and Hunan (3 Mt) (table 5; National Bureau of Statistics of China, 2015h).

As of 2014, China's proven and probable chromite ore reserves were estimated to be 4.2 Mt compared with 4.0 Mt in 2013. The reserve level was in the range of 4.0 to 5.8 Mt from 2005 to 2014, and had remained at a relatively low level since 2009. The leading regions for chromite ore reserves were Tibet (which had 1.7 Mt of proven and probable reserves), Gansu (1.4 Mt), Inner Mongolia (560,000 t), Xinjiang (440,000 t), Hebei (46,000 t), and Qinghai (37,000 t) (National Bureau of Statistics of China, 2015h).

As of 2014, China's proven and probable copper reserves were estimated to be 28.4 Mt (copper content) compared with 27.5 Mt in 2013. The reserve level was in the range of 27 to 30 Mt from 2005 to 2014. The leading regions for copper reserves were Jiangxi (which had 9.4 Mt of proven and probable reserves), Inner Mongolia (4.2 Mt), Yunnan (3.0 Mt), Tibet (2.7 Mt), Xinjiang (2.1 Mt), Anhui (1.7 Mt), Shanxi (1.6 Mt), and Gansu (1.4 Mt) (National Bureau of Statistics of China, 2015h).

As of 2014, China's proven and probable iron ore reserves were estimated to be 20.7 Gt compared with 19.9 Gt in 2013. The reserve level was in the range of 19 to 22 Gt from 2005 to 2014. The leading regions for iron ore reserves were Liaoning (which had 5.2 Gt of proven and probable reserves), Hebei (2.9 Gt), Sichuan (2.6 Gt), Inner Mongolia (2.5 Gt), Shanxi (1.7 Gt), Shandong (910 Mt), Anhui (875 Mt), and Xinjiang (521 Mt). China's iron ore had an average grade of about 30% iron, which was lower than that on global markets (normally about 60% iron) (National Bureau of Statistics of China, 2015g).

As of 2014, China's proven and probable lead reserves were estimated to be 17.2 Mt (lead content) compared with 15.8 Mt in 2013. The reserve level was in the range of 13 to 17 Mt from 2005 to 2014. The leading regions for lead reserves were Inner Mongolia (which had 5.8 Mt of proven and probable reserves), Yunnan (2.1 Mt), Guangdong (1.2 Mt), Sichuan (993,000 t), Tibet (929,000 t), Henan (577,000 t), Jiangxi (532,000 t), and Hunan (511,000 t) (National Bureau of Statistics of China, 2015h).

As of 2014, China's proven and probable manganese ore reserves were estimated to be 214 Mt compared with 215 Mt 2013. The reserve level was in the range of 182 to 234 Mt from 2005 to 2014, and showed a gradual increase from 2009.

The leading regions for manganese ore reserves were Guangxi (which had 85 Mt of proven and probable reserves), Guizhou (44 Mt), Hunan (19 Mt), Liaoning (14 Mt), Yunnan (12 Mt), Hubei (6.6 Mt), Inner Mongolia (5.7 Mt), and Xinjiang (5.6 Mt) (National Bureau of Statistics of China, 2015g).

As of 2014, China's proven and probable tungsten reserves were estimated to be 2.33 Mt (WO_3 content) compared with 2.35 Mt in 2013. The reserve level was in the range of 1.56 Mt (in 2011) to 2.60 Mt (in 2005) from 2005 to 2014, and had remained at 2.33 Mt since 2012. (National Bureau of Statistics of China, 2015f).

As of 2014, China's proven and probable molybdenum reserves were estimated to be 8.37 Mt (molybdenum content) compared with 8.07 Mt in 2013. The reserve level had increased gradually from 2005 (3.63 Mt) to 2014. Production of molybdenum concentrates (molybdenum content) was 132,000 t in 2014 compared with 115,000 t in 2013. Consumption of molybdenum increased by 2.8% to 74,000 t in 2014 compared with that of 2013 (Jiang and others, 2015; National Bureau of Statistics of China, 2015f; Tungsten & Molybdenum Monthly, 2015a).

As of 2014, China's proven and probable tin reserves were estimated to be 1.11 Mt (tin content) compared with 1.17 Mt in 2013. The reserve level was in the range of 1.11 to 1.55 Mt from 2005 to 2014, and decreased gradually from 2005 (1.55 Mt) to 2014 (National Bureau of Statistics of China, 2015f).

As of 2014, China's proven and probable titanium reserves were estimated to be 216 Mt (ore) compared with 220 Mt in 2013. The reserve level was in the range of 210 to 245 Mt from 2005 to 2014. The leading regions for titanium reserves were Sichuan (which had 194 Mt of proven and probable reserves), Hubei (11 Mt), Shandong (7.8 Mt), Hebei (2.8 Mt), Xinjiang (457,000 t), Yunnan (31,000 t), and Henan (4,600 t) (National Bureau of Statistics of China, 2015h).

As of 2014, China's proven and probable vanadium reserves were estimated to be 9.0 Mt (V_2O_5 content) compared with 9.1 Mt in 2013. The reserve level was in the range of 8.8 Mt to 14.0 Mt from 2005 to 2014, and decreased gradually since 2006. The leading regions for vanadium reserves were Sichuan (which had 5.7 Mt of proven and probable reserves), Guangxi (1.7 Mt), Gansu (900,000 t), Hubei (290,000 t), Hebei (100,000 t), Shaanxi (74,000 t), Jiangxi (65,000 t), and Anhui (59,000 t) (National Bureau of Statistics of China, 2015g).

As of 2014, China's proven and probable zinc reserves were estimated to be 40.3 Mt (zinc content) compared with 37.7 Mt in 2013. The reserve level was in the range of 31 to 42 Mt from 2005 to 2014. The leading regions for zinc reserves were Inner Mongolia (which had 11.8 Mt of proven and probable reserves), Yunnan (9.1 Mt), Gansu (3.1 Mt), Sichuan (2.3 Mt), Guangdong (2.1 Mt), Xinjiang (1.8 Mt), Guangxi (1.5 Mt), and Qinghai (1.1 Mt) (National Bureau of Statistics of China, 2015h).

China was ranked first in graphite reserves in the world before 2013, but in 2013, Brazil surpassed China. As of 2013, the world's natural graphite proven reserves were about 130 Mt; the countries with the largest reserves were Brazil, China, and India. Reserves in China were estimated to be about 41.3 Mt. China's graphite reserves were located mainly in Heilongjiang, Hunan, Inner Mongolia, Jilin, Shandong, and Shanxi. Reserves in Inner Mongolia and Heilongjiang were mainly crystalline graphite, and those in Hunan were mainly amorphous graphite. Identified resources of crystalline graphite increased to 220 Mt in 2013 from 185 Mt in 2010 (Liu, 2015).

As of 2014, China's proven and probable kaolin reserves were estimated to be 575 Mt compared with 496 Mt in 2013. The reserve level was in the range of 380 to 650 Mt from 2005 to 2014, and had increased gradually since 2011. The leading regions for kaolin reserves were Guangxi (which had 319 Mt of proven and probable reserves), Fujian (536 Mt), Guangdong (534 Mt), Inner Mongolia (481 Mt), Jiangxi (298 Mt), Hunan (199 Mt), Hainan (192 Mt), and Zhejiang (83 Mt) (National Bureau of Statistics of China, 2015h).

As of 2014, China's proven and probable magnesite (ore) reserves were estimated to be 1,080 Mt compared with 1,210 Mt in 2013. The reserve level was in the range of 1,080 to 2,080 Mt from 2005 to 2014, and had deceased gradually since 2009. The leading regions for magnesite reserves were Liaoning (which had 925 Mt of proven and probable reserves), Shandong (148 Mt), Hebei (9 Mt), Sichuan (2 Mt), and Qinghai (0.5 Mt) (National Bureau of Statistics of China, 2015h).

As of 2014, China's proven and probable phosphorus (ore) reserves were estimated to be 3,070 Mt compared with 3,020 Mt in 2013. The reserve level was in the range of 2,890 to 3,700 Mt from 2005 to 2014. The leading regions for phosphorus reserves were Hubei (which had 800 Mt of proven and probable reserves), Guizhou (664 Mt), Yunnan (648 Mt), Sichuan (470 Mt), Hebei (193 Mt), Liaoning (81 Mt), Jiangxi (62 Mt), and Qinghai (60 Mt) (National Bureau of Statistics of China, 2015h).

As of 2014, China's potash reserves were estimated to be 595 Mt (KCl content) compared with 534 Mt in 2013. The reserve level was in the range of 270 to 610 Mt from 2005 to 2014, and had remained at the high end since 2011 (National Bureau of Statistics of China, 2015h).

As of 2014, China's proven and probable pyrite (ore) reserves were estimated to be 1,340 Mt compared with 1,300 Mt in 2013. The reserve level was in the range of 1,300 to 1,900 Mt from 2005 to 2014, and had decreased gradually since 2005. The leading regions for pyrite reserves were Sichuan (which had 380 Mt of proven and probable reserves), Guangdong (160 Mt), Inner Mongolia (149 Mt), Anhui (148 Mt), Jiangxi (140 Mt), Henan (60 Mt), Guizhou (57 Mt), and Yunnan (49 Mt) (National Bureau of Statistics of China, 2015h).

In June 2012, the Information Office of the State Council issued a white paper titled "Situation and Policies of China's Rare Earth Industry." The white paper provided an overview of the status of China's rare-earth industry and policies for future development. According to the white paper, China's rare-earth reserves accounted for about 23% of the world's total. Although the total REO reserves of China could not be determined officially, they were estimated to be 43.5 Mt or more REO in 2014. Light rare-earth reserves were located mainly in Baotou, Inner Mongolia, and Liangshan, Sichuan. Ion-absorbed-type middle and heavy rare-earth deposits were found mainly in Ganzhou, Jiangxi, Longyan, Fujian, and some other southern areas (State Council, 2012, p. 1–6; Chen, Zhanheng, 2015).

As of 2014, China's coal reserves were estimated to be 240 Gt compared with 240 Gt in 2013. The reserve level was in the range of 210 to 330 Gt from 2005 to 2014, and had remained at a relatively low level since 2011. The leading regions for coal reserves were Shanxi (which had 92 Gt of reserves), Inner Mongolia (49 Mt), Xinjiang (16 Gt), Shaanxi (9.5 Gt), Henan (8.6 Gt), Anhui (8.4 Gt), and Heilongjiang (6.2 Gt) (National Bureau of Statistics of China, 2015g).

As of 2014, China's crude oil reserves (proven and probable) were estimated to be 3.43 Gt compared with 3.37 Gt in 2013. The reserve level was in the range of 2.49 to 3.40 Gt from 2005 to 2014, and had increased gradually since 2005. The leading regions for crude oil reserves were Xinjiang (which had 589 Mt of proven and probable reserves), Shaanxi (363 Mt), Heilongjiang (219 Mt), Jilin (181 Mt), and Liaoning (158 Mt). The offshore crude oil reserves were 558 Mt (National Bureau of Statistics of China, 2015g).

As of 2014, China's natural gas reserves were estimated to be 4.95 trillion cubic meters compared with 4.6 trillion cubic meters in 2013. The reserve level was in the range of 2.8 to 5.0 trillion cubic meters from 2005 to 2014, and had increased gradually since 2005. The leading regions for natural gas reserves were Sichuan (which had 1.2 trillion cubic meters of reserves), Xinjiang (975 billion cubic meters), Inner Mongolia (810 billion cubic meters), Shaanxi (805 billion cubic meters), Chongqing (246 billion cubic meters), Qinghai (146 billion cubic meters), Heilongjiang (134 billion cubic meters), and Jilin (66 billion cubic meters). The offshore natural gas reserves were 410 billion cubic meters (National Bureau of Statistics of China, 2015g).

Outlook

Annual economic growth in 2015 is expected to be about 7%, and in 2016 may be further moderated to 6% to 6.5%. Since 2012, China's GDP growth has been about 7.5%, which is 1.8% below the 2008 to 2012 average annual rate of growth of 9.3%. As the growth momentum moderates, the raw material industries, including iron and steel, nonferrous metals, cement, and heavy chemicals, are facing slower growth in demand from downstream industries, such as real estate and manufacturing (Ministry of Industry and Information Technology, 2015a).

The output of the mineral industry in China is expected to be steady and the raw material sector is expected to grow at a relatively moderate rate of about 8% (in terms of value-added GDP). China's Government is expected to implement strategic projects, such as rebuilding of outdated residential areas in cities, developing infrastructure in the Midwest, and implementing the "one belt one road" initiative (a development strategy and framework that focuses on connectivity and cooperation among countries primarily between China and the rest of Eurasia, and consists of two main components—the land-based "Silk Road Economic Belt" and oceangoing "Maritime Silk Road") in order to achieve steady economic growth in 2015 and beyond. These projects are intended to provide stable support to the raw materials industries. Some mineral industries with serious excess capacity, such as aluminum and steel, will face greater difficulties, and growth within these industries will likely slow further. Elimination of outdated capacities is expected to continue. The overcapacity situation may not improve in the short term considering that significant new capacities are being added each year and some inactive facilities could be reactivated. The growth in demand may depend largely on the growth in downstream industries, which are also adjusting to the new normal economy. For some minor minerals and metals, new demand could come from some new technologies and products that might be sufficient to generate growth (Ministry of Industry and Information Technology, 2015a).

China will likely play a growing role in the world's metals and minerals markets in the coming years. The effect of China's mineral industry on the global mineral industry is much larger than that previously because of significant accumulated growth in the past two decades. China's mineral companies are expected to participate in global mining activities at a greater level in the coming years, to invest in mineral-rich countries to secure raw material supplies, and to look for opportunities to sell their excess capacity to the world—for example, the Las Bambas copper mine deal and increasing steel exports. The lifting of China's trade restriction on some materials is expected to improve its role as a global supplier of these materials in the long term, although the export volume may not change in the short term.

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TABLE 1
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2010	2011	2012	2013	2014
METALS						
Aluminum:						
Bauxite, gross weight	thousand metric tons	44,000	45,000	47,000	50,400 [r]	65,000
Alumina	do.	29,000	34,100	37,700	44,400	47,800
Metal:						
Primary	do.	16,200	20,100 [r]	23,500 [r]	26,500 [r]	28,300
Secondary	do.	4,000	4,100	4,200	3,100	3,700
Total	do.	20,200	24,200	27,700	29,600 [r]	32,000
Antimony:						
Mine, Sb content		150,000	150,000	136,000	121,000 [r]	120,000
Metal		193,000	200,000	240,000	250,000 [r]	255,000
Bismuth:						
Mine output, Bi content		6,500	7,000	7,500	7,500	7,800
Metal		14,000	15,000	15,000	15,500	16,000
Cadmium, smelter		7,360	6,670	7,270	7,000	7,500
Chromite, gross weight	thousand metric tons	200	200	200	200	210
Cobalt:						
Mine output, Co content		6,380	6,800	7,500	7,200	7,700
Metal		4,120	5,430	6,400	6,500	6,000
Copper:						
Mine output, Cu content		1,160,000	1,270,000	1,410,000 [r]	1,540,000 [r]	1,620,000
Metal:						
Smelter, primary	thousand metric tons	2,900	3,030	3,600	4,000	3,600
Refined:						
Primary	do.	2,950	3,390	3,930	4,180 [r]	4,820
Secondary	do.	1,700	1,850	1,950	2,000 [r]	2,000
Total	do.	4,650	5,240	5,880	6,180 [r]	6,820
Germanium		100	110	105	110	115
Gold, mine output, Au content		345	362	403	428 [r]	486
Indium, primary and secondary		330	380	405	430	460
Iron and steel:						
Iron ore, gross weight	thousand metric tons	1,070,000	1,330,000	1,330,000	1,450,000	1,510,000
Pig iron[4]	do.	597,330	640,510	663,500	708,970	713,740
Ferroalloys	do.	24,300	28,400	31,300	37,700	39,800
Steel, crude[4]	do.	637,230	685,280	723,880	779,040	822,300
Steel, rolled[4]	do.	802,760	886,190	955,780	1,067,620	1,125,130
Lead:						
Mine output, Pb content	do.	1,980	2,400	2,610	2,850 [r]	2,800
Metal:						
Smelter, primary	do.	2,800	3,110	3,120	3,200	3,050
Refined:						
Primary	do.	2,800	3,200	3,220	3,280	3,140
Secondary	do.	1,360	1,400	1,370	1,500	1,600
Total	do.	4,160	4,600	4,590	4,780	4,740
Magnesium, metal and alloy		654,000	675,000	698,000	770,000	874,000
Manganese:						
Ore, Mn content	thousand metric tons	2,600	2,800	2,900	3,000	3,200
Metal		1,370,000	1,480,000	1,200,000	1,300,000	1,350,000
Mercury, mine output, Hg content		1,600	1,500	1,350	1,600	2,200
Molybdenum, mine output, Mo content		96,600	103,000	120,000	115,000	132,000
Nickel:						
Mine output, Ni content		80,000	90,000	93,300	93,300	98,400
Matte		139,000	166,000	153,000	160,000	168,000
Smelter		159,000	175,000	197,000	245,000	350,000

See footnotes at end of table.

TABLE 1—Continued
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2010	2011	2012	2013	2014
METALS—Continued						
Niobium and tanlatum, mine output:						
Nb_2O_5 content		32	25	20	21	20
Ta_2O_5 content		86	75	80	72	72
Rhenium, Re content in NH_4ReO_4[5]	kilograms	2,000	2,100	2,200	2,300	2,350
Silicon, metal	thousand metric tons	1,140	1,350	1,130	1,300	1,200
Silver, mine output, Ag content		3,500	3,700	3,900	4,100	4,060
Tin:						
Mine output, Sn content		93,200 [r]	105,000 [r]	95,000 [r]	97,000 [r]	99,000
Metal		149,000	156,000	148,000	159,000 [r]	187,000
Titanium:						
Ilmenite, TiO_2 equivalent		700,000	850,000	800,000	850,000	850,000
Sponge		57,000	68,000	82,000	105,000	101,000
Tungsten, mine output, W content		59,000	61,800	64,400 [r]	71,100 [r]	71,000
Vanadium, V_2O_5 in vanadiferous slag product		58,000	65,000	71,000	80,000	80,000
Zinc:						
Mine output, Zn content	thousand metric tons	3,840	4,050	4,500 [r]	4,730 [r]	4,930
Refined:						
Primary	do.	5,030	5,040	4,770	5,160 [r]	5,610
Secondary	do.	175	173	120	150	170
Total	do.	5,210	5,210	4,890	5,310	5,780
INDUSTRIAL MINERALS						
Asbestos		400,000	385,000	420,000	420,000	410,000
Barite	thousand metric tons	3,700 [r]	4,100 [r]	4,200	3,200 [r]	3,900
Bentonite	do.	3,400	3,500	3,500	3,600	3,650
Boron, mine, B_2O_3 equivalent		150,000	150,000	160,000	160,000	160,000
Bromine		100,000	100,000	105,000	110,000	110,000
Cement, hydraulic[4]	million metric tons	1,882	2,099	2,210	2,411 [r]	2,492
Diatomite		400,000	440,000	420,000	420,000	420,000
Dolomite	thousand metric tons	8,200	8,200	8,300	8,300	8,500
Feldspar	do.	2,000	2,100	2,100	2,500	2,500
Fluorspar	do.	4,600	4,200	4,400	4,400	3,900
Graphite		700,000	800,000	820,000	810,000 [r]	750,000
Gypsum	thousand metric tons	126,000	127,000	128,000	129,000	130,000
Kaolin	do.	3,260	3,200	3,300	3,300	3,200
Lime	do.	190,000	200,000	220,000	230,000	235,000
Lithium, Li content, all types		6,000	7,200	9,500	10,500	11,000
Magnesite	thousand metric tons	14,000	19,000	16,000	17,000	16,000
Mica		750,000	760,000	770,000	780,000	785,000
Nitrogen, N content of ammonia[4]	thousand metric tons	40,870	43,250	45,520	48,326 [r]	45,642
Phosphate rock, P_2O_5 equivalent	do.	20,400	24,000	28,500	33,500 [r]	36,000
Potash, marketable, K_2O equivalent	do.	3,600	3,800	3,770	5,300 [r]	6,110
Rare earths, rare-earth oxide equivalent		120,000	105,000	100,000	95,000	105,000
Salt[4]	thousand metric tons	70,380	67,420	69,120	73,676 [r]	70,497
Sodium compounds:						
Mirabilite	do.	6,500	6,000	5,500	5,000	5,500
Soda ash, natural and synthetic[4]	do.	20,350	22,940	24,010	24,320 [r]	25,260
Strontium carbonate		150,000	145,000	140,000	130,000	140,000
Sulfur:						
Native	thousand metric tons	1,100	1,100	1,200	930 [r]	1,000
Content of pyrite	do.	4,400	5,300	5,400	4,580 [r]	5,000
Byproduct, all sources	do.	4,100	3,300	3,300	2,600 [r]	2,840
Total	do.	9,600	9,700	9,900	8,110 [r]	8,840
Talc and related materials	do.	2,000	2,200	2,100	2,200	2,100

See footnotes at end of table.

TABLE 1—Continued
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2010	2011	2012	2013	2014
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand metric tons	500,000	450,000	500,000	540,000 r	530,000
Bituminous	do.	2,420,000	2,800,000	2,830,000	3,070,000 r	3,000,000
Lignite	do.	320,000	270,000	330,000	356,000 r	350,000
Total	do.	3,240,000	3,520,000	3,660,000	3,970,000 r	3,880,000
Coke, all types[4]	do.	388,640	432,710	447,790	481,794 r	479,809
Gas, natural:						
Gross	billion cubic meters	95	102	107	121 r	130
Marketed	do.	83	90	95	100	115
Petroleum:						
Crude, including crude from oil shale	million 42-gallon barrels	1,480	1,480	1,510	1,520	1,530
Refinery products	do.	4,220	4,470	4,640	4,790	5,370
Uranium		1,350	1,500	1,600	1,650	1,700

[r] Revised. do. Ditto.

[1] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2] Table includes data available through January 19, 2016.

[3] In addition to the commodities listed, China also produces beryllium, diamond, gallium, iodine, platinum-group metals, selenium, stone, tellurium, and zirconium, but available information is inadequate to make reliable estimates of output.

[4] Reported by China's National Statistical Bureau.

[5] Includes rhenium from imported copper and molybdenum concentrates.

TABLE 2
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners[1]	Location of main facilities[2]	Annual capacity[e]
Aluminum:			
Alumina	Chongqing Aluminum Co. [Aluminum Corporation of China (Chinalco)]	Chongqing	800
Do.	Chongqing Dingtai Tuoyuan Alumina Co.	do.	150
Do.	Nanchuan Pioneer Alumina Co.	do.	200
Do.	Guangxi Huayin Aluminum Co. Ltd.	Guangxi, Bose	2,000
Do.	Pingguo Aluminum Co. [Aluminum Corporation of China (Chinalco)]	Guangxi, Pingguo	1,200
Do.	Guizhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Guizhou, Guiyang	1,200
Do.	Chalco Zunyi Aluminum Co. Ltd. [Aluminum Corporation of China (Chinalco)]	Guizhou, Zunyi	1,000
Do.	Luoyang Wanji Xiangjiang Aluminum Co. Ltd.	Henan, Luoyang	800
Do.	Sanmenxia Yixiang Aluminum Co. Ltd. (Henan Yima Coal Group)	Henan, Mianchi	600
Do.	Pingdingshan Huiyuan Chemical Co.	Henan, Pingdingshan	300
Do.	Yangquan Coalmine Aluminum (Sanmenxia) Co. Ltd.	Henan, Sanmenxia	1,200
Do.	Orient Hope (Sanmenxia) Aluminum Co. Ltd.	do.	1,200
Do.	Zhengzhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Henan, Zhengzhou	2,200
Do.	Zhongzhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Hunan, Zhongzhou	2,800
Do.	Shandong Huayu Alumina Co. Ltd. (Shandong Chiping Xinfa Aluminum and Electricity Group)	Shandong, Chiping	1,800
Do.	Longhou Donghai Alumina Co. Ltd. (Nanshan Group)	Shandong, Nanshan, Longkou	1,600
Do.	Shandong Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Shandong, Zibo	2,000
Do.	Bingzhou Weiqiao Aluminum Co.	Shandong, Zouping	1,600
Do.	Shanxi Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Shanxi, Hejin	2,700
Do.	Liulin Senze Group	Shanxi, Liulin	600
Do.	Coalmine Aluminum (Sanmenxia) Co. Ltd.	Shanxi, Sanmenxia	1,200
Do.	Shanxi Luneng Jinbei Aluminum Co. Ltd.	Shanxi, Yuanping	2,000
Do.	Wenshan Aluminum Co. Ltd. (Yunnan Aluminum Co.)	Yunnan, Wenshan	800
Metal	Baiyin Aluminum Plant	Gansu, Baiyin	500
Do.	Gansu Dongxing Aluminum Co. Ltd. (Jiuquan Iron and Steel Co. Ltd.)	Gansu, Jiayuguan	900
Do.	Lanzhou Aluminum Plant (Jiuquan Iron and Steel Co. Ltd.)	Gansu, Lanzhou	210
Do.	Liancheng Aluminum Plant	do.	235
Do.	Gansu Dongxing Aluminum Co. Ltd. (formerly Gansu Longxi Aluminum Plant) (Jiuquan Iron and Steel Co. Ltd.)	Gansu, Longxi	360
Do.	Yinhai Aluminum Co. Ltd.	Guangxi, Laibin	125
Do.	Pingguo Aluminum Co. [Aluminum Corporation of China (Chinalco)]	Guangxi, Pingguo	380
Do.	Guizhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Guizhou, Guiyang	400
Do.	Chalco Zunyi Aluminum Co. Ltd. [Aluminum Corporation of China (Chinalco)]	Guizhou, Zunyi	250
Do.	Henan Zhongfu Industry Co. Ltd.	Henan, Gongyi	180
Do.	Jiaozuo Wanfang Aluminum Co. Ltd.	Henan, Jiaozuo	420
Do.	Henan Wanji Aluminum Co. Ltd.	Henan, Luoyang	125
Do.	Henan Zhongmai Mianchi Aluminum Plant	Henan, Mianchi	400
Do.	Shangqiu Aluminum Smelter	Henan, Shangqiu	180
Do.	Yichuan Yugang Longquan Aluminum Co.	Henan, Yichuan	600
Do.	Shangqiu Shenhuo Foguang Aluminum Co. Ltd.	Henan, Yongcheng	280
Do.	Hanjiang Danjiangkou Aluminum Co. Ltd.	Hubei, Danjiangkou	110
Do.	Hunan Chuanquan Aluminum Co. Ltd.	Hunan, Taoyuan	210
Do.	Fushun Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Liaoning, Fushun	340
Do.	Baotou Aluminum Plant	Nei Mongol, Baotou	250
Do.	Orient (East Hope) Aluminum Plant (Orient Group)	do.	800
Do.	Nei Mongol HMHJ Aluminum Electricity Co. Ltd.	Nei Mongol, Holin Gol	400
Do.	Qingtongxia Aluminum Plant (China Power Investment Corp. and Ningxia Qingtongxia Energy Group Co. Ltd.)	Ningxia, Qingtongxia	1,150
Do.	Qiaotou Aluminum Co. Electrolysis Branch	Qinghai, Datong	750
Do.	Qinghai Aluminum Smelter [Aluminum Corporation of China (Chinalco)]	Qinghai, Xining	560
Do.	Qinghai West Mining Baihe Aluminum Co. Ltd.	do.	112
Do.	Tongchuan Xingguang Aluminum Co. Ltd.	Shaanxi, Tongchuan	250

See footnotes at end of table.

TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners[1]	Location of main facilities[2]	Annual capacity[e]
Aluminum—Continued:				
Metal—Continued		Shandong Chiping Xinfa Aluminum and Power Group	Shandong, Chiping	360
Do.		Taishan Aluminum-Power Co. Ltd.	Shandong, Fecheng	125
Do.		Shandong Nanshan Aluminum Co. Ltd. (Nanshan Group)	Shandong, Nanshan, Longkou	156
Do.		Shandong Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Shandong, Zibo	120
Do.		Bingzhou Weiqiao Aluminum Co.	Shandong, Zouping	250
Do.		Zouping Aluminum Co. Ltd.	do.	150
Do.		Huaze Aluminum and Power Co. Ltd.	Shanxi, Hejin	400
Do.		New Orient Aluminum Co. Ltd.	Shanxi, Taiyuan	75
Do.		Chalco Shanxi Huasheng Aluminum Co. Ltd. [Aluminum Corporation of China (Chinalco)]	Shanxi, Yongji	220
Do.		Shanxi Guanlv Aluminum Co. Ltd.	Shanxi, Yuncheng	210
Do.		Qient (East Hope) Aluminum Plant (Orient Group)	Xinjiang, Changji Prefecture	540
Do.		Xinjiang Qiya Aluminum Co. Ltd.	do.	450
Do.		Xinjiang Nongliushi Aluminum Co. Ltd.	Xinjiang, Wujiaqu	1,200
Do.		Yunnan Aluminum Plant	Yunnan, Kunming	500
Antimony		Huaxi (China Tin) Group Industrial Co.	Guangxi, Hechi	25
Do.		Jiyuan Wangyang Smelter (Jiyuan Wangyang Smeltery Group Co. Ltd.)	Henan, Jiaozuo	10
Do.		Hunan Chenzhou Mining Group Co. Ltd.	Hunan, Yuanling	20
Do.		Hsikuangshan Twinkling Star Antimony Co. Ltd. (China Minmetals Group)	Hunan, Lengshuijiang	40
Asbestos		China National Nonmetallic Industry Corp.	Nei Mongol, Baotou; Shanxi, Lai Yuan, and Lu Liang	130
Barite		do.	Guizhou, Xiangshou	NA
Bismuth	metric tons	Guangzhou Smelter	Guangdong, Guangzhou	300
Do.	do.	Jiyuan Wangyang Smelter (Jiquan Wangyang Smeltery Group Co. Ltd.)	Henan, Jiaozuo	200
Do.	do.	Hunan Bismuth Industry Co. Ltd.	Hunan, Chouzhou	3,500
Do.	do.	Shizhuyuan Nonferrous Metals Co. Ltd.	Hunan, Shizhuyuan	1,200
Do.	do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	350
Do.	do.	Yunnan Copper Group Co. Ltd.	Nei Mongol, Chifeng	300
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	300
Cadmium	do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	1,000
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	800
Coal		Liuzhuang Mining Co. Ltd. coal mine (State Development and Investment Corp.)	Anhui, Bengbu	11,400
Do.		Xieqiao Coal Mine (Huainan Mining (Group) Co. Ltd.)	Anhui, Fuyang, Yingshang	9,600
Do.		Fengfeng Group Co. Ltd. coal mines (Jizhong Energy Group Co. Ltd.)	Hebei, Handan	20,000
Do.		Handan Mining Group Co. Ltd. coal mines (Jizhong Energy Group Co. Ltd.)	do.	11,000
Do.		Jixi Mining Group coal mines (Heilongjiang Longmay Mining Holding Group Co. Ltd.)	Heilongjiang, Jixi	16,000
Do.		Zhongguo Pingmei Shenma Energy Chemical Group Co. Ltd. coal mines (China Pingmei Shenma Group)	Henan, Pingdingshan	40,000
Do.		Buetai Coal Mine [(Shendong Coal Group Co. Ltd.) Shenhua Group Corp. Ltd.]	Nei Mongol, Erdos	20,000
Do.		Bulianta Coal Mine [(Shendong Coal Group Co. Ltd.) Shenhua Group Corp. Ltd.]	do.	25,000
Do.		Heidaigou Coal Mine [(Shenhua Group Zhungeer Energy Co. Ltd.) Shenhua Group Corp. Ltd.]	do.	25,000
Do.		Suancigou Coal Mine (Nei Mongol Yitai Coal Co. Ltd.)	Nei Mongol, Jungar Banner	12,000
Do.		Diliuta Coal Mine [(Shendong Coal Group Co. Ltd.) Shenhua Group Corp. Ltd.]	Shaanxi, Yulin	20,000
Do.		Hancheng Coal Mine [(Hancheng Coal Bureau) Shaanxi Coal and Chemical Industry Group Co. Ltd.]	Shaanxi, Hancheng	20,000
Do.		Chenghe Coal Mine [Chenghe Mining Bureau) Shaanxi Coal and Chemical Industry Group Co. Ltd.	Shaanxi, Chengcheng	20,000
Do.		Yanzhou Coalfield [(Yanzhou Coal Mining Co. Ltd.) Yankuang Group Co., Ltd.]	Shandong, Jining	35,000
Do.		Antaibao Coal Mine [(Pingshuo Coal Industry Co., operator) China National Coal Group Corp.]	Shanxi, Pingshuo	20,000
Do.		Tongxin Coal Mine (Datong Coal Mine Group Co. Ltd.)	Shanxi, Datong	10,000

See footnotes at end of table.

TABLE 2—Continued

CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners[1]	Location of main facilities[2]	Annual capacity[e]
Coal—Continued		Xishan, Hedong, and Huoxi coalfields [(Xishan Coal and Electricity Coking Coal Group Co.) Shanxi Coking Coal Group Co. Ltd.]	Shanxi, Taiyuan	33,000
Do.		Lu'an Mining Group Co. Ltd.	Shanxi, Changzhi, Xiangyuaj	90,000
Cobalt	metric tons	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	10,000
Do.	do.	Huayou Cobalt Co. Ltd.	Zhejiang, Tongxiang	3,000
Copper, refined		Jinchang Smelter (Tongling Nonferrous Metals Group Holding Co. Ltd.)	Anhui, Tongling	170
Do.		Jinlong Smelter (Tongling Nonferrous Metals Group Holding Co. Ltd.)	do.	400
Do.		Wuhu Smelter (Hengxin Copper Industry Group Co.)	Anhui, Wuhu	60
Do.		Zijin Copper Co. Ltd.	Fujian, Shanghang	200
Do.		Baiyin Nonferrous Metals Group Co. Ltd.	Gansu, Baiyin	100
Do.		Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	600
Do.		do.	Guangxi, Fangchenggang	400
Do.		Luoyang Copper Processing Factory	Henan, Luoyang	50
Do.		Daye Nonferrous Metals Co.	Hubei, Daye	400
Do.		Zhangjiagang United Copper Co. (Tongling Nonferrous Metals Group Holding Co. Ltd.)	Jiangsu, Zhangjiagang	200
Do.		Guixi Smelter (Jiangxi Copper Co. Ltd.)	Jiangxi, Guixi	1,200
Do.		Dongfang Copper Co. (Huludao Nonferrous Metals Group)	Liaoning, Huludao	100
Do.		Chifeng Fubang Copper Co. Ltd.	Nei Mongol, Chifeng	100
Do.		Chifeng Jingeng Copper Co. Ltd.	Nei Mongol, Chifeng, Harqin Banner	100
Do.		Shandong Dongying Fangyuan Nonferrous Metals Co. Ltd.	Shandong, Dongying	400
Do.		Shandong Jinsheng Nonferrous Metals Corp.	Shandong, Linyi	100
Do.		Yanggu Xiangguang Copper Co. Ltd. (Shandong Fengxiang Group)	Shandong, Liaocheng, Yanggu	600
Do.		Yantai Penghui Copper Industry Co. Ltd.	Shandong, Yantai	200
Do.		Taiyuan Copper Industry Co.	Shanxi, Taiyuan	100
Do.		Yuanqu Smelter (Zhongtiaoshan Nonferrous Metals Group Co. Ltd.)	Shanxi, Yuangu	100
Do.		Huili Kunpeng Co. Ltd.	Sichuan, Huili	100
Do.		Tianjin Datong Copper Co. Ltd. (formerly Tianjin Copper Electrolysis Factory)	Tianjin	200
Do.		Yunnan Smelter (Chinalco Yunnan Copper Group Co. Ltd.)	Yunnan, Kunming	250
Do.		Hangzhou Fuchunjiang Smelting Co. Ltd.	Zhejiang, Fuchunjiang	100
Gallium	metric tons	Chalco Zunyi Aluminum Co. Ltd. [Aluminum Corporation of China (Chinalco)]	Guizhou, Zunyi	40
Do.	do.	Pingguo Aluminum Co. [Aluminum Corporation of China (Chinalco)]	Guangxi, Pingguo	40
Do.	do.	Shandong Aluminum Plant	Shandong, Zibo	20
Gas, natural	billion cubic meters	China National Petroleum Corp.	Sichuan	10
Germanium	metric tons	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoguan	30
Do.	do.	Nanjing Germanium Co. Ltd.	Jiangsu, Nanjing	30
Do.	do.	Nei Mongol Xilingol Tongtai Germanium Refine Co. Ltd.	Nei Mongol, Xilinhot	20
Do.	do.	Shanghai Lontai Copper Co. Ltd.	Shanghai	10
Do.	do.	Yunnan Lincang Xinyuan Germanium Industrial Co. Ltd.	Yunnan, Lincang	50
Do.	do.	Yunnan Chihong Zinc and Germanium Industrial Co. Ltd.	Yunnan, Qujing	50
Gold, refined	do.	Zijin Copper Co. Ltd.	Fujian, Shanghang	5
Do.	do.	China National Gold Corp.	Henan, Lingbao	10
Do.	do.	Zhongyan Gold Smelter (Zhongjin Gold Co. Ltd.)	Henan, Sanmenxia	30
Do.	do.	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	20
Do.	do.	Laizhou Gold Co.	Shandong, Laizhou	15
Do.	do.	Yanggu Xiangguang Copper Co. Ltd. (Shandong Fengxiang Group)	Shandong, Liaocheng, Yanggu	20
Do.	do.	Shandong Yanggu Xiangguang Co. Ltd.	Shandong, Yanggu	20
Do.	do.	Yantai Penghui Copper Industry Co. Ltd.	Shandong, Yantai	5
Do.	do.	Zhaoyuan Gold Co.	Shandong, Zhaoyuan	15
Do.	do.	Great Wall Gold Silver Refinery	Sichuan, Chengdu	100
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	130

See footnotes at end of table.

TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners[1]	Location of main facilities[2]	Annual capacity[e]
Graphite		Jixi Aoyu Graphite Co. Ltd.	Heilongjiang, Jixi and Luo	60
Do.		Nei Mongol Xinghe Jingxin Graphite Co. Ltd.	Nei Mongol, Xinghe	10
Indium	metric tons	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	25
Do.	do.	Guangxi Tanghan Zinc & Indium Co. Ltd.	Guangxi, Hechi	30
Do.	do.	Laibin Smelter [Liuzhou Huaxi (China Tin) Group Co.]	Guangxi, Laibin	50
Do.	do.	Guangxi Debang Technology Co. Ltd.	Guangxi, Liuzhou	85
Do.	do.	Liuzhou Zinc Products Co.	do.	20
Do.	do.	Yintai Technology Co. Ltd.	do.	40
Do.	do.	Yuguang Gold-Lead Co. Ltd.	Henan, Jiyuan	10
Do.	do.	Hsikuangshan Twinkling Star Antimony Co. Ltd. (China Minmetals Group)	Hunan, Lengshuijiang	7
Do.	do.	Xiangtan Zhengtan Nonferrous Metal Co. Ltd.	Hunan, Xiangtan	75
Do.	do.	Zhuzhou Smelter	Hunan, Zhuzhou	60
Do.	do.	Nanjing Germanium Co. Ltd.	Jiangsu, Nanjing	150
Do.	do.	Nanjing Sanyou Electronic Material Co. Ltd.	do.	50
Do.	do.	Huludao Nonferrous Metals Group Co.	Liaoning, Huludao	50
Do.	do.	Yunnan Chengfeng Nonferrous Metals Co. Ltd.	Yunnan, Gejiu	10
Do.	do.	Yunnan Mengzi Mining and Smelting Co. Ltd.	Yunnan, Honghe	30
Iron and steel:				
Iron ore		Ma'anshan Iron and Steel Co.	Anhui, Maanshan	10,000
Do.		Shoudu (Capital) Mining Co.	Beijing	20,000
Do.		Jiuquan Iron and Steel Co. Ltd.	Gansu, Jiayuguan	4,000
Do.		Hainan Iron Mine	Hainan, Changjiang	4,600
Do.		Handan Xingtai Metallurgical Bureau (Hebei Iron and Steel Group Co.)	Hebei, Handan	3,800
Do.		Tangshan Iron and Steel Co. (Hebei Iron and Steel Group Co.)	Hebei, Tangshan	3,000
Do.		Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	5,100
Do.		Meishan Metallurgical Co.	Jiangsu, Nanjing	2,000
Do.		Banshigou Iron Mine Mining Co.	Jilin, Hunjiang	1,400
Do.		Anshan Mining Co.	Liaoning, Anshan	30,000
Do.		Benxi Iron and Steel Co.	Liaoning, Benxi	13,700
Do.		Baotou Iron and Steel and Rare Earth Co.	Nei Mongol, Baotou	10,000
Do.		Taiyuan Iron and Steel Co.	Shanxi, Taiyuan	4,000
Do.		Dabaoshan Mining Co.	Guangdong, Qujiang	1,670
Do.		Panzhihua Mining Co.	Sichuan, Panzhihua	13,000
Do.		Kunming Iron and Steel Co.	Yunnan, Kunming	1,400
Ferroalloys		Shoudu (Capital) Iron and Steel (Group) Co.	Beijing	35
Do.		Qingshan Holding Group Co. Ltd.	Fujian, Fu'an	300
Do.		Desheng Nickel Industry Co. Ltd.	Fujian, Luoyuanwan	920
Do.		Northwest Ferroalloy Co.	Gansu, Yongdeng	60
Do.		Zunyi Ferroalloy Co.	Guizhou, Zunhi	100
Do.		Zhejiang Huaguang Smelting Group	Jiangxi, Hengfeng	50
Do.		Jilin Ferroalloy Co.	Jilin, Jilin	250
Do.		Jinzhou Ferroalloy Co.	Liaoning, Jinzhou	90
Do.		Liaoyang Ferroalloy Co.	Liaoning, Liaoyang	70
Do.		Shanghai Iron and Steel Co. Ltd.	Shanghai	180
Do.		Emei Ferroalloy Co.	Sichuan, Emei	70
Do.		Hengshan Ferroalloy Co.	Zhejiang, Jiande	70

See footnotes at end of table.

TABLE 2—Continued

CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners[1]	Location of main facilities[2]	Annual capacity[e]
Iron and steel—Continued:			
Crude steel	Ma'anshan Iron and Steel Co.	Anhui, Maanshan	10,000
Do.	Liuzhou Iron and Steel Group	Guangxi, Liuzhou	6,000
Do.	Shougang-Tangshan Iron and Steel Group Co. Ltd.	Hebei, Caofeidian	10,000
Do.	Handan Iron and Steel General Work (Hebei Iron and Steel Group Co.)	Hebei, Handan	12,000
Do.	Shougang Qianan Iron and Steel Co. Ltd. (Shougang)	Hebei, Qianan	7,800
Do.	Tangshan Iron and Steel Co. (Taigang) (Hebei Iron and Steel Group Co.)	Hebei, Tangshan	15,000
Do.	Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	12,000
Do.	Shagang Group Co. Ltd.	Jiangsu, Zhangjiagang	30,000
Do.	Anshan Iron and Steel (Group) Co. (Angang) (Anben Iron and Steel Group)	Liaoning, Anshan	16,000
Do.	Benxi Iron and Steel Co. (Bengang) (Anben Iron and Steel Group)	Liaoning, Benxi	6,000
Do.	Anshan Iron and Steel (Group) Co. (Angang) (Anben Iron and Steel Group)	Liaoning, Yingkou, Bayuquan	6,500
Do.	Baotou Iron and Steel and Rare Earth Co. (Baogang Group)	Nei Mongol, Baotou	10,000
Do.	Baoshan Iron and Steel (Group) Corp. (Baosteel) [Baogang Group]	Shanghai	19,000
Do.	Shanghai Iron and Steel Co. Ltd.	do.	6,000
Do.	Shandong Jinan Iron and Steel Group Co. (Shandong Iron and Steel Group)	Shandong, Jinan	10,000
Do.	Shandong Laiwu Iron and Steel Group Co. (Shandong Iron and Steel Group)	Shandong, Laiwu	10,000
Do.	Taiyuan Iron and Steel Co. (Taigang)	Shanxi, Taiyuan	5,000
Do.	Panzhihua Iron and Steel (Group) Co. (Pangang)	Sichuan, Panzhihua	6,000
Do.	Xinjiang Biyi Iron and Steel Group (Baogang Group)	Xinjiang, Urumqi	6,000
Lead	Jiuhua Smelter (Tongling Nonferrous Metals Group Holding Co. Ltd.)	Anhui, Chizhou	80
Do.	Baiyin Nonferrous Metals Co. Ltd.	Gansu, Baiyin	80
Do.	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	100
Do.	Laibin Smelter [Huaxi (China Tin) Group Co.]	Guangxi, Laibin	100
Do.	Hechi Nanfang Nonferrous Metals Smelting Co. Ltd.	Guangxi, Hechi	80
Do.	Anyang Smelter (Yubei Metal Co.)	Henan, Anyang	160
Do.	Jiyuan Wangyang Smelter (Jiquan Wangyang Smeltery Group Co. Ltd.)	Henan, Jiaozuo	200
Do.	Jinli Smelter (Jiyuan Jinli Smelting Co.)	Henan, Jiyuan	300
Do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	do.	300
Do.	Henan Lingye Co. Ltd.	Henan, Lingbao	100
Do.	Hanjiang Smelter	Hubei, Luhekou	50
Do.	Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyang	100
Do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	100
Do.	Xuzhou Chunxing Alloy Co. Ltd.	Jiangsu, Xuzhou	150
Do.	Jiangxi Jinde Lead Co. Ltd.	Jiangxi, Shangrao	80
Do.	Huludao Nonferrous Metals Group Co. Ltd.	Liaoning, Huludao	30
Do.	Shaanxi Dongling Group	Shaaxi, Baoji	100
Do.	Yunnan Tin Co. Ltd. (Yunnan Tin Corp.)	Yunnan, Gejiu	100
Do.	Kunming Smelter	Yunnan, Kunming	100
Do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	100
Lithium, carbonate	Tibet Mineral Development Co. Ltd.	Gansu, Baiyin	5
Do.	Jiangxi Ganfeng Lithium Co. Ltd.	Jiangxi, Xinyu	3
Do.	Sichuan Ni/Co Guorun New Material Co. Ltd.	Sichuan, Pengshan	2
Do.	Sichuan Shehong Lithium Co. Ltd.	Sichuan, Shehong	2
Do.	Sichuan Tianqi Lithium Industry Co. Ltd. (Chengdu Tianqi Group Co. Ltd.)	Sichuan, Suining	10
Do.	Sichuan Aba Guangsheng Lithium Industrial Co. Ltd.	Sichuan, Wenchuan	2
Do.	Qinghai Yanhu Industry Group Co. Ltd.	Qinghai, Golmud	10
Do.	Qinghai CITIC Guoan Technology Development Co. Ltd.	do.	20
Do.	Qinghai Lithium Industry Co. Ltd.	Qinghai, Xining	20
Do.	Xinjiang Haoxin Lithium Salt Development Co. Ltd. (formerly Xinjiang Lithium Co.)	Xinjiang, Urumqi	5

See footnotes at end of table.

TABLE 2—Continued

CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners[1]	Location of main facilities[2]	Annual capacity[e]
Magnesium	Zunyi Titanium Co. Ltd.	Guizhou, Zunyi	24
Do.	Ningxia Huayuan Magnesium Group	Ningxia, Yinchuan	15
Do.	Huayu Enterprises (Group) Ltd.	Shanxi, Jishan	35
Do.	Taiyuan Tongxiang Magnesium Metal Co. Ltd.	Shanxi, Taiyuan	45
Do.	Taiyuan Yiwei Magnesium Co. Ltd.	do.	21
Do.	Wenxi Biyun Magnesium Co. Ltd.	Shanxi, Wenxi	30
Do.	Wenxi Yinguang Magnesium Group	do.	40
Manganese, metal	Chongqing Tycoon Manganese Co. Ltd.	Chongqing	23
Do.	Guangxi Dameng Manganese Industry Co. Ltd.	Guangxi, Nanning	70
Molybdenum, concentrate	Luoyang Luanchuan Molybdenum Industry Group Co., Ltd.	Henan, Luanchuan	30
Do.	Jinduicheng Molybdenum Industry Group Co. Ltd.	Shaanxi, Huaxian	30
Nickel, refined	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	130
Do.	Guangxi Yinyi Science and Technic Mine	Guangxi, Yulin, Bohai	10
Do.	Guangxi Yulin Weinie Co. Ltd.	Guangxi, Bobai	18
Do.	Jiangxi Jiangli Science and Technology Co. Ltd.	Jiangxi, Fenyi	50
Do.	Jilin Jien Nickel Industry Co. Ltd.	Jilin, Panshi	10
Do.	Inco New Nickel Materials (Dalian) Co. Ltd.	Liaoning, Dalian	32
Do.	Schaanxi Huaze Nickel and Cobalt Metal Co. Ltd.	Shaanxi, Xian	5
Do.	Chengdu Electro-Metallurgy Factory	Sichuan, Chengdu	5
Do.	Huili Kunpeng Co. Ltd.	Sichuan, Huili	10
Do.	Sichuan Ni/Co Guorun New Material Co. Ltd.	Sichuan, Pengshan	10
Do.	Xinjiang Fukang Smelter	Xinjiang, Fukang	15
Do.	Xinjiang Xinxin Mining Co. Ltd.	Xinjiang, Fuyun	7
Do.	Yuanjiang Nickel Industry Co. Ltd.	Yunnan, Yuxi	5
Palladium and platinum kilograms	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	3,500
Petroleum, crude	Shengli Administration	Hebei, Shengli	33,500
Do.	Daqing Administration	Heilongjiang, Daqing	55,000
Do.	Liaohe Administration	Liaoning, Liaohe	15,000
Do.	Bohai Offshore Oil Corp.	Bohai	4,000
Do.	Nanhai East Corp.	Nanhai	5,000
Potash	Qinghai Yanhu Industry Group Co. Ltd.	Qinghai, Charhan	2,000
Do.	Xinjiang Lop Nur Potassic Salt Scientific and Technology Development Co.	Xinjiang, Ruoqiang	1,200
Rare earths	Fujian Changting Jinlong Rare Earth Co. Ltd.	Fujian, Changting	4
Do.	Gansu Rare Earths Co.	Gansu, Baiyin	32
Do.	Zhujiang Smelter	Guangdong, Guangzhou	5
Do.	Jiangyin Jiahua Advanced Material Resources Co. Ltd. (Neo Material Technologies)	Jiangsu, Jiangyin	3
Do.	Liyang Rhodia Rare Earth New Material Co. Ltd. (Rhodia Group)	Jiangsu, Liyang	12
Do.	Jiangsu Guosheng Rare Earth Co. Ltd.	Jiangsu, Taixing	5
Do.	Yixing Xinwei Leeshing Rare Earth Co. Ltd. (China Rare Earth Holdings Ltd.)	Jiangsu, Yixing	6
Do.	Dingnan Nanfang Rare Earth Co. Ltd.	Jiangxi, Ganzhou, Dingnan	4
Do.	Longnan Guangdong Rising Rare Earth Smelting Co. Ltd.	Jiangxi, Ganzhou, Longnan	4
Do.	Baotou Iron and Steel and Rare Earths Corp. (Baogang Group)	Nei Mongol, Baotou	55
Do.	Leshan Primet (Puruimei) New Materials Co. Ltd. (US Primet LLC)	Sichuan, Leshan	8
Do.	Sichuan Jiangxi Copper Rare Earth Co. Ltd. (Jiangxi Copper Co. Ltd.)	Sichuan, Mianning	18
Rhenium, rhenate kilograms	Guixi Smelter (Jiangxi Copper Co. Ltd.)	Jiangxi, Guixi	3,000
Do. do.	Western Xinxing Metal Materials Co. Ltd.	Shaanxi, Luonan	200
Salt	Shandong Haihua Group Co. Ltd.	Shandong, Weifang	1,400
Do.	Zigong Zhangjiaba Salt Chemical Plant	Sichuan, Zigong	250
Selenium metric tons	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	50
Do. do.	Guixi Smelter (Jiangxi Copper Co. Ltd.)	Jiangxi, Guixi	300

See footnotes at end of table.

TABLE 2—Continued

CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners[1]	Location of main facilities[2]	Annual capacity[e]
Silver	metric tons	Zijin Copper Co. Ltd.	Fujian, Shanghang	125
Do.	do.	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	150
Do.	do.	Laibin Smelter [Huaxi (China Tin) Group Co.]	Guangxi, Laibin	80
Do.	do.	Daye Nonferrous Metals Co.	Hubei, Daye	300
Do.	do.	Jiyuan Wangyang Smelter (Jiquan Wangyang Smeltery Group Co. Ltd.)	Henan, Jiaozuo	1,600
Do.	do.	Jinli Smelter (Jiyuan Jinli Smelting Co.)	Henan, Jiyuan	800
Do.	do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	do.	730
Do.	do.	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	430
Do.	do.	Huludao Nonferrous Metals Group Co. Ltd.	Liaoning, Huludao	80
Do.	do.	Yanggu Xiangguang Copper Co. Ltd. (Shandong Fengxiang Group)	Shandong, Liaocheng, Yanggu	600
Do.	do.	Yantai Penghui Copper Industry Co. Ltd.	Shandong, Yantai	80
Do.	do.	Great Wall Gold Silver Refinery	Sichuan, Chengdu	300
Do.	do.	Yunnan Chengfeng Nonferrous Metals Co. Ltd.	Yunnan, Gejiu	150
Do.	do.	Yunnan Tin Co. Ltd. (Yunnan Tin Corp.)	do.	160
Do.	do.	Yunnan Smelter (Yunnan Copper Group Co. Ltd.)	Yunnan, Kunming	450
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	150
Strontium, carbonate		Chongqing Chonglong Strontium Co. Ltd.	Chongqing	20
Do.		Chongqing Tongliang Redbutterfly Strontium Co.	do.	40
Do.		Shijiazhuang Zhengding Xian Jinshi Chemical Co. Ltd	Hebei, Shijiazhuang	3
Do.		Hebei Xinji Chemical Group	Hebei, Xinji	2
Do.		Nanjing Jinyan Strontium Co. Ltd.	Jiangsu, Lishui	2
Talc		China National Nonmetallic Industry Corp.	Guangxi, Longshen	130
Do.		do.	Liaoning, Haicheng	50
Do.		do.	Shandong, Qixia	5
Tellurium, concentrate	metric tons	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	50
Tin, smelter		Guihuacheng Smelter (Guangxi Pinggui PGMA Co. Ltd.)	Guangxi, Hezhou	8
Do.		Laibin Smelter (Guangxi China Tin Group Co. Ltd.)	Guangxi, Laibin	25
Do.		Chenzhou Smelter (Yunnan Tin Co. Ltd.)	Hunan, Chenzhou	20
Do.		Nanshan Tin Co. Ltd.	Jiangxi, Nankang	10
Do.		Yunnan Chengfeng Nonferrous Metals Co. Ltd.	Yunnan, Gejiu	20
Do.		Yunnan Tin Co. Ltd. (Yunnan Tin Corp.)	do.	70
Do.		Yunnan Gejiu Zili Metallurgy Co. Ltd.	Yunnan, Huogudu	20
Titanium, sponge		Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	15
Do.		Guizhou Southwest Titanium Co. Ltd.	Guizhou, Guiyang	3
Do.		Zunbao Titanium Co. Ltd.	Guizhou, Tongzi	10
Do.		Zunyi Titanium Co. Ltd.	Guizhou, Zunyi	20
Do.		Tangshan Tianhe Titanium Co. Ltd.	Hebei, Tangshan	10
Do.		Luoyang Sun Rui Wanji Titanium Industry Co. Ltd.	Henan, Xinan	10
Do.		Chaoyang Baisheng Zirconium Co. Ltd.	Liaoning, Chaoyang	8
Do.		Chaoyang Jintai Titanium Co. Ltd.	do.	7
Do.		Fushun Titanium Co. Ltd.	Liaoning, Fushun	5
Do.		Jinzhou Huashen Nonferrous Metals Plant	Liaoning, Jinzhou	10
Do.		Baoti Titanium Industry Co. Ltd.	Shaanxi, Baoji	10
Do.		Gangqi Xinyu Titanium Co. Ltd.	Sichuan, Panzhihua	5
Do.		Hengwei Titanium Co. Ltd.	do.	5
Do.		Panzhihua Iron and Steel (Group) Co. (Pangang)	do.	15
Do.		Yunnan Metallurgical Group	Yunnan, Lufeng	10
Tungsten, concentrate		Ninghua Hangluoken Tungsten Mine (Amoi Tungsten Co. Ltd.)	Fujian, Ninghua	4
Do.		Shizhuyuan Nonferrous Metals Co.	Hunan, Chenzhou	5
Do.		Yaogangxian Tungsten Mine	Hunan, Yizhang	3
Do.		Jiangxi Tungsten and Rare Earth Co. Ltd.	Jiangxi, Ganzhou	15

See footnotes at end of table.

TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners[1]	Location of main facilities[2]	Annual capacity[e]
Uranium	metric tons	Tianshan Uranium Co.	Mengqiguer, Xinjiang	500
Zinc		Northwest China Lead-Zinc Smelter (Baiyin Nonferrous Metals Co. Ltd.)	Gansu, Baiyin	150
Do.		Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	270
Do.		Hechi Nanfang Nonferrous Metal Smelting Co. Ltd.	Guangxi, Hechi	200
Do.		Liuzhou Nonferrous Metal Smelting Co. Ltd. (formerly Liuzhou Zinc Products Factory)	Guangxi, Liuzhou	100
Do.		Yugang Gold-Lead Co. Ltd.	Henan, Jiyuan	300
Do.		Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyang	60
Do.		Hsikuangshan Twinkling Star Antimony Co. Ltd. (China Minmetals Group)	Hunan, Lengshuijiang	40
Do.		Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	500
Do.		Huludao Zinc Smelting Co. (Huludao Nonferrous Metals Group. Co. Ltd.)	Liaoning, Huludao	390
Do.		Zijin Bayannur Co. Ltd. (Zijin Mining Group)	Nei Mongol, Bayannur League	220
Do.		Chifeng NFC Kumba Hongye Zinc Co. Ltd. (China Nonferrous Metals Mining Group Co. Ltd.)	Nei Mongol, Chifeng	230
Do.		Xingan Copper and Zinc Smelter	Nei Mongol, Xilinuole	100
Do.		Dongling Zinc Industry Co. Ltd. (Dongling Group)	Shaanxi, Baoji	250
Do.		Laibin Smelter (Guangxi China Tin Group Co. Ltd.)	Yunnan, Laibin	60
Do.		Yunnan Jinding Zinc Co. Ltd. (Sichuan Hongda Group)	Yunnan, Lanping	120
Do.		Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	280

[e] Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

[1] Most companies are owned by either the Central Government or a Provincial government.

[2] Listed by Province or Autonomous Region, followed by locality.

TABLE 3
CHINA: EXPORTS OF SELECTED MINERAL COMMODITIES IN 2014

Commodity	Quantity (metric tons)	Value (thousands)
METALS		
Aluminum:		
Alumina	118,028	$108,421
Metal and alloys:		
Unwrought	666,772	1,432,777
Semimanufactures	3,670,000	11,947,994
Antimony, unwrought	1,444	12,892
Copper, metal and alloys:		
Unwrought	268,719	1,894,552
Semimanufactures	507,840	4,231,309
Iron and steel:		
Pig iron and cast iron	240,000	97,520
Steel:		
Bars and rods	30,870,000	16,261,230
Shapes and sections	4,750,000	2,903,914
Sheets and plates	43,670,000	32,791,085
Tube and pipe	1,680,000	4,583,815
Wire of steel or iron	2,160,000	2,328,081
Ferroalloys	540,000	1,226,051
Scrap	957	1,257
Manganese, unwrought	308,697	649,405
Molybdenum, ores and concentrates	11,145	152,451
Tin, metal and alloys, unwrought	941	21,481
Tungsten, tungstates	3,023	95,095
Zinc:		
Metal and alloys, unwrought	132,719	293,205
Oxide and peroxide	12,444	22,385
INDUSTRIAL MINERALS		
Barite	2,670,000	348,237
Cement	13,910,000	772,442
Fluorspar	410,000	120,205
Granite	7,460,000	3,963,123
Graphite, natural	280,000	298,006
Magnesia, fused	2,280,000	618,354
Rare-earth products	27,769	374,691
Talc	670,000	167,539
MINERAL FUELS AND RELATED MATERIALS		
Coal	5,740,000	695,433
Coke, semicoke	8,510,000	1,709,153
Petroleum:		
Crude oil	600,000	490,435
Refinery products	29,670,000	25,783,636

Source: General Administration of Customs of the People's Republic of China, 2014, China monthly exports and imports, no. 12.

TABLE 4
CHINA: IMPORTS OF SELECTED MINERAL COMMODITIES IN 2014

(Metric tons unless otherwise specified)

Commodity	Quantity	Value (thousands)
METALS		
Aluminum:		
Bauxite	36,280,965	$2,067,208
Alumina	5,280,000	1,924,508
Metal and alloys, unwrought	353,649	744,697
Semimanufactures	499,874	3,016,794
Scrap	2,310,000	3,462,025
Chromium, chromite	9,390,000	1,830,659
Cobalt:		
Ore and concentrates	192,262	397,896
Unwrought and powder	4,323	40,157
Copper:		
Ore and concentrates	11,810,000	21,645,117
Metal and alloys, unwrought	4,220,000	29,610,311
Semimanufactures	603,951	6,036,918
Scrap	3,870,000	10,924,064
Iron and steel:		
Iron ore	932,510,000	93,642,293
Steel:		
Bars and rods	1,200,000	1,724,262
Seamless pipe	480,000	1,990,343
Shapes and sections	420,000	448,195
Sheets and plates	12,080,000	12,380,276
Scrap	2,560,000	1,684,280
Lead ore and concentrates	1,810,000	2,163,258
Manganese ore	16,210,000	2,718,748
Nickel:		
Ore and concentrates	47,758,290	4,578,467
Metal, refined greater than 99.95% Ni	5,916	107,660
Metal, other refined	124,063	2,107,599
Titanium dioxide	216,022	589,069
INDUSTRIAL MINERALS		
Diamond kilograms	2,597	9,145,609
Nitrogen, phosphorus, and potassium fertilizers:		
Compound fertilizers	1,110,000	639,997
Diammonium phosphate	230,000	99,850
Potassium chloride	8,030,000	2,521,818
Potassium sulfate	50,000	30,353
Urea	5,867	3,049
MINERAL FUELS AND RELATED MATERIALS		
Coal	291,220,000	22,249,979
Liquefied natural gas	19,830,000	12,222,286
Petroleum:		
Crude oil	308,380,000	228,311,556
Refinery products	30,000,000	23,434,886

Source: General Administration of Customs of the People's Republic of China, 2014, China monthly exports and imports, no. 12.

TABLE 5

CHINA: RESERVES OF MAJOR MINERAL COMMODITIES IN 2014

(Thousand metric tons unless otherwise specified)

Commodities		Reserves[1, 2]
Antimony, Sb		532
Barite, ore	million metric tons	30
Bauxite	do.	983
Chromite, ore		4,200
Coal	billion metric tons	240
Copper, Cu		28,400
Fluorspar, ore		39,800
Gas, natural	billion cubic meters	4,950
Gold, Au	metric tons	2,020
Graphite, mineral		41,300
Iron ore, ore	million metric tons	20,700
Kaolin	do.	575
Lead, Pb		17,200
Magnesite, ore	million metric tons	1,080
Manganese, ore	do.	214
Mirabilite, Na_2SO_4	do.	5,510
Molybdenum, Mo		8,370
Nickel, Ni		2,530
Petroleum	million metric tons	3,430
Phosphorus, ore	do.	3,070
Potash, KCl	do.	595
Pyrite, ore	do.	1,340
Rare earths (rare-earth oxide)		43,500 [3]
Salt, NaCl	billion metric tons	83
Silica, ore	million metric tons	1,900
Silver, Ag		39
Talc, ore	million metric tons	84
Tin, Sn		1,110
Titanium, ore	million metric tons	216
Tungsten, WO_3		2,330
Vanadium, V_2O_5		9,000
Zinc, Zn		40,300

[1] Rounded to three significant digits.

[2] The National Bureau of Statistics of China categorizes these as "basic reserves."

[3] Source: Chen, Zhanheng, 2015, Situation of China rare earth industry and policies: Critical Metals Symposium, Sendai, Japan, October 27–30, Proceedings, p. 5.

Source: China Statistical Yearbook 2015 (http://www.stats.gov.cn/tjsj/ndsj/2015/indexeh.htm).

THE MINERAL INDUSTRY OF FIJI

By Sean Xun

The mineral industry was of minor importance to Fiji's economy and accounted for less than 1% of the country's gross domestic product (GDP) in recent years. Gold had been the major mineral produced in Fiji since the first gold discovery in the 1930s. Recently, a number of bauxite deposits had been identified, and foreign investments in these projects had added some value and diversity to the mineral industry (table 1; Fiji Bureau of Statistics, 2015, p. 24; Ministry of Lands and Mineral Resources, 2015a).

Government Policies and Programs

The Ministry of Lands and Mineral Resources is the Government agency that manages all state land initiatives related to the country's mineral sector and groundwater resources. The total area under state land leases that is managed by the Ministry of Lands and Mineral Resources accounted for about 4% of the total land mass of Fiji. The Mineral Resources Department (MRD), which is a subunit of the Ministry of Lands and Mineral Resources, is Fiji's national geological survey and mining organization. The MRD develops mining policies, provides geologic information, assists mining investors, and facilitates the exploration for and the development of mineral and petroleum resources in the country. The Ministry of Lands and Mineral Resources performs its duties as authorized by such relevant laws and regulations as the Mining Act, the Oil and Petroleum Act, the Quarry Act, the Surveyors Act, the Land Use Decree 2010, the Land Use Regulations, and the Environment Management Act (Ministry of Lands and Mineral Resources, 2015a–c).

Production

Silver production decreased by 22% to about 360 kilograms (kg) (estimated) in 2014 from 462 kg (revised) in 2013. Gold production decreased by 4.8% to about 1,160 kg (estimated) in 2014 from 1,218 kg (revised) in 2013. The decrease in silver and gold production was attributed to the decrease in the amount of ore produced at the Vatukoula gold mine. Bauxite production, which was estimated based on trade data, increased by about 6.7% to 640,000 metric tons (t) from 600,000 t (revised) in 2013. Cement production increased by about 5% to 190,000 t (estimated) owing to the production added by the new Tengy cement factory in Lami (table 1; Guenioui, 2014; Fiji Bureau of Statistics, 2015, p. 24, 35; Lal, 2015).

Structure of the Mineral Industry

Table 2 is a list of the major mineral industry facilities in Fiji. The table provides the location and production capacities of these facilities. Most of the producing mining companies in Fiji were privately owned. International companies, mainly from China, started investing in Fiji during recent years. As of yearend 2014, a Chinese company owned 66% interest in the Vatukoula gold mine and another wholly owned bauxite mining business in Fiji. In August, Chinese investors opened a new cement plant, the Tengy cement factory, in Fiji (Guenioui, 2014; Tengy Cement Fiji Ltd., 2015).

Mineral Trade

The value of Fiji's exported goods decreased by 9.9% in 2014 compared with that of 2013. The value of exports of mineral products increased by 12.3% in 2014. The leading export partners were the United States, which received 12.6% of Fiji's total exports; Australia, 12.1%; the United Kingdom, 8.7%; China, 5.9%; and Japan and New Zealand, 4.5% each. Fiji's major mineral commodity export was gold. In 2014, 1,232 kg of gold was exported compared with 1,307 kg in 2013. Gold exports contributed 8.2% to total domestic exports in 2014 compared with 9.9% in 2013; bauxite contributed 1.5% for both 2013 and 2014 (Fiji Bureau of Statistics, 2015, p. 85, 87, 89).

In 2014, the value of the country's imports increased by 3.4% compared with that of 2013. The value of imports of mineral products increased by 13.7%. The leading import partners were Singapore, which supplied 28.4% of Fiji's total imports; Australia, 14.2%; New Zealand, 13.6%; and China, 12.4%. Fiji's major mineral commodity imports were petroleum products, which accounted for 27.8% of the country's total imports in 2014 compared with 23.5% in 2013 (Fiji Bureau of Statistics, 2015, p. 81, 89, 91).

Commodity Review

Metals

Bauxite and Alumina.—China's Shangdong Xinfa Aluminum & Electricity Group (Xinfa) operated the Nawailevu Mine in Lekutu District, Bua Province. About 1.2 million metric tons (Mt) of bauxite had been shipped to China in the period 2011 to 2014. The Nawailevu Mine was closed by the end of November, and rehabilitation of the mine site was started in 2014. In November, a 20-year land lease was approved by the Government. The lease allowed Xinfa to develop a new bauxite mining site at Votua in Lekutu District, Bua Province. A projected 400,000 t of bauxite would be extracted from this site, which is located 500 meters from the Nawailevu site (Butabua, 2014).

Gold.—The Vatukoula gold mine, which was the only producing gold mine in Fiji, was owned by Vatukoula Gold Mines plc (VGM), a company registered in the United Kingdom. The mine is located in the northern part of Fiji's main island, Viti Levu. According to VGM, the mine's resources contained 126 t of gold and its reserves contained 23 t of gold.

The mine had both open pit and underground operations and was expected to operate predominantly as an underground mine in the future. In 2014, VGM produced an estimated 1,160 kg of gold compared with 1,218 kg in 2013. About 180,000 t of ore was mined during the second half of 2014, of which about 138,000 t was from the underground mine. The average grade of ore from the underground mine for the period was 5.6 grams per metric ton (g/t) gold (table 1; Lal, 2015; Vatukoula Gold Mines plc, 2015a).

Zhongrun International Mining Co. Ltd. of China increased its total holding in VGM to about 66% in 2014 and became the controlling entity. Additional financing of $30 million was expected to be necessary for the company to reach its long-term production targets (Vatukoula Gold Mines plc., 2015b, p. 1, 2, 15).

Lion One Metals Ltd. (Lion One) of Canada owned the Tuvatu gold project, which is located 50 kilometers south of the Vatukoula Mine. The total indicated resource of the Tuvatu project was estimated to be about 1.1 Mt at a grade of 8.17 g/t gold for a total of about 9,000 kg of gold, and the inferred resource was 1.3 Mt at a grade of 10.6 g/t gold for a total of about 13,800 kg of gold. In October, the construction and operation environmental management plan of the project was approved by the Government. The plan allowed for the construction of an underground or open pit mine, a processing plant, onsite roads and infrastructure, pipelines, a tailings impoundment, and water-management facilities. The environmental impact assessment for this project was approved by the Government in 2013. The project was expected to have a mine life of 6.16 years, an average recovery rate of 86.3%, and average annual production of 1,782 kg of gold (Northern Miner, The, 2014; Freudigmann and others, 2015, p. 1.12).

Industrial Minerals

Cement.—Fiji Industries Ltd. had a production capacity of 200,000 metric tons per year of cement. In May, the company was renamed Pacific Cement Ltd. (PCL). Before September, PCL was a joint venture between Fijian Holdings Ltd. Corp. (51%) and South Pacific Cement Ltd. In September, South Pacific Cement sold its 47% share to Vinod Patel Group of Fiji. According to PCL, during the fiscal year ending in June 2014, more than 37% of its production was exported to countries in the Asia and the Pacific region, including New Zealand (Global Cement, 2014; Valemei, 2014).

In 2012, Tengy Cement Company Ltd. of China acquired an operating license to operate a cement factory in Fiji. In August 2014, the Tengy cement factory (a $50 million investment) was officially opened at Veisari near Lami. The main products of the plant included general purpose portland cement and general purpose blended cement. According to the Government, the new cement factory would help address the short supply of cement, reduce the price, and contribute to Fiji's economy. The production capacity of the plant was estimated to be 50,000 t. From February to August, the plant produced 20,000 t of cement. The first exports to other Pacific island countries were scheduled to be shipped in September (Guenioui, 2014; Tengy Cement Fiji Ltd., 2015).

Outlook

Gold production by VGM is expected to decrease as the company actively pursues financing solutions to reduce its operating costs. The development of an underground mine is likely to be delayed owing to the company's challenging financial situation. The Tuvatu gold project is expected to add production capacity, once implemented. Cement production and exports are expected to increase as the Tengy cement factory enters its first full year of operation in 2015. Bauxite production is expected to decrease as the Nawailevu Mine was closed.

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TABLE 1
FIJI: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
Bauxite[e]		--	50	500	600 [r]	640
Cement, hydraulic		163 [r]	170 [r]	150 [r]	181 [r]	190 [e]
Gold, mine output, Au content	kilograms	1,903 [r]	1,572 [r]	1,453 [r]	1,218 [r]	1,160 [e]
Limestone[e]		50	50	50	60	60
Silver, mine output, Ag content	kilograms	328 [r]	418 [r]	342 [r]	462 [r]	360 [e]

[e] Estimated data are rounded to no more than three significant digits. [r] Revised. -- Zero.

[1] Table includes data available through August 28, 2015.

[2] In addition to the commodities listed, crushed and dimension stone, coral sand, marble, and other construction materials are produced, but available information is inadequate to make reliable estimates of output.

TABLE 2
FIJI: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Bauxite		Shangdong Xinfa Aluminum & Electricity Group	Nawailevu Mine in Lekutu District, Bua Province	800
Cement		Pacific Cement Ltd. (PCL) (Fijian Holding Ltd. Corp., 51%, and Vinod Patel Group, 47%)	Lami, Suva	200
Do.		Tengy cement factory (Tengy Cement Company Ltd.	do.	50
Gold	kilograms	Vatukoula Gold Mines plc. (Zhongrun International Mining Co. Ltd., 66%)	Vatukoula, Viti Levu	2,000
Silver	do.	do.	do.	500

[e] Estimated. Do., do. Ditto.

THE MINERAL INDUSTRY OF INDIA

By Karine M. Renaud

India held significant resources of metals and industrial minerals; it produced 89 mineral commodities, including 72 industrial minerals; 10 metals; and 7 mineral fuels and related materials. The country ranked 1st in world production of garnet (industrial) and iron oxide pigments; 2d in cement and graphite (natural)[1]; 3d in chromium,[1] lime, nitrogen, and pig iron; 4th in crude steel and iron ore; 5th in aluminum; 6th in bromine, lead, manganese,[1] vermiculite, and zircon concentrates[1]; 7th in silicon; 10th in ilmenite concentrates; and 12th in gypsum (Apodaca, 2016; Bedinger, 2016b; Bray, 2016; Corathers, 2016a, b; Crangle, 2016; Fenton, 2016; Guberman, 2016; Olson, 2016a, b; Papp, 2016; Schnebele, 2016a, b; Tanner, 2016a, b; Tuck, 2016; van Oss, 2016).

The country's estimated share of world production of garnet (industrial) in 2014 amounted to 48%; graphite (natural),[1] 15%; chromium,[1] 13%; lime, manganese,[1] and pig iron, 5% each; aluminum and iron ore, 4% each; ilmenite concentrates, vermiculite, and zircon concentrates,[1] 3% each; and lead, 2% (Bedinger, 2016b; Bray, 2016; Corathers, 2016a, b; Fenton, 2016; Guberman, 2016; Olson, 2016a, b; Papp, 2016; Tanner, 2016b; Tuck, 2016).

Minerals in the National Economy

India's real gross domestic product (GDP) increased by 7.3% in 2014 from 5.0% in 2013, owing to an increase in exports and industrial activities; the nominal GDP in 2014 was $2.07 trillion. Mining and quarrying accounted for 2.5% of the GDP in 2014 compared with 2.1% in 2013. Owing to a decrease in production and the value of some mineral commodities, the total value of mineral production (excluding nuclear energy related minerals) decreased by 9.3% in 2014 compared with 2013. In 2014, coal accounted for 32.6% of the total value of mineral production; mineral fuels (other than coal), 30.4%; iron ore, 14.2%; natural gas, 12.6%; lignite, 2.4%; limestone, 2.1%; and zinc, 1.2% (Indian Bureau of Mines, 2014i; International Monetary Fund, 2014, p. 55; 2015a, p. 5; 2015b, p. 33; World Bank, The, 2014; Ministry of Statistics and Programme Implementation, 2015, p. x).

In 2014, India continued implementing policy changes to attract foreign investment in the mining industry. For exploration activities in oil and natural gas fields and related oil and natural gas infrastructure, 100% of foreign ownership was allowed. Central Public Sector Enterprises allowed 49% foreign ownership of petroleum refineries without approval from the Foreign Investment Promotion Board. Foreign direct investment in the petroleum and natural gas sector increased by 8.5% to $24.3 billion in 2014 compared with $22.4 billion, revised, in 2013 (Ministry of Petroleum and Natural Gas, 2015, p.11).

Although India allowed 100% foreign direct investment in the mining sector, only two companies, ArcelorMittal S.A. of Luxembourg and Pohang Iron and Steel Co. (POSCO) of the Republic of Korea, proposed constructing steel plants with production capacities of 12 million metric tons per year (Mt/yr) and 6 Mt/yr in 2009 and 2005, respectively. As of 2014, construction had not yet started owing to delays in the approval processes (Chaturvedi and Mukherji, 2013).

Government Policies and Programs

In 2014, a new Government was installed following elections. The new Government planned to change some policies related to the country's industrial mineral sector. In 2014, the Mines and Minerals (Development and Regulations) Act, 1957 (MMDR) was being amended, and was expected to be implemented in 2015. The objectives of the amended MMDR were to improve mining laws and to identify illegally awarded mining licenses, to make allocation of licenses more transparent, to improve living conditions at communities around mines, to give State Governments the right to award licenses with the approval of the Central Government (Corporate Catalyst India Pvt. Ltd., 2014, p. 2; Indian Parliament, 2014; Yamada, 2014, p. 16; Biswas, 2015).

In September 2014, the Government launched a program called "Make in India." The objectives of the "Make in India" program were (1) to attract foreign companies to invest in India, (2) to reform policies (such as, land acquisition laws and labor laws), (3) to construct infrastructure, (4) to increase the manufacturing sector, and (5) to create new jobs (Mehra, 2014).

In September 2014, the Government revised the royalty rates for major minerals, excluding coal, lignite, and sand for hydraulic stowing. The royalty rates in the States of Andhra Pradesh, Jharkhand, Karnataka, and Odisha increased for the following metals: nonmetallurgical-grade bauxite, 25% of the average sale price based on its value; lead, contained lead in the concentrate produced, 14.5%; cadmium, chromite, and iron ore, 15%; zinc, contained zinc in concentrate produced, 10%; gold, byproduct, 13.3%; zinc, contained zinc in ore produced, 9.5%; lead, contained lead in ore produced, 8%; silver, byproduct, 7%; manganese ore and silver, primary, 5%; copper, 4.62%; gold, primary, 4%; manganese concentrates, 1.7%; and nickel, 0.12%. Royalty rates increased for the following industrial minerals: slate, 45% of the average sale price based on its value; gypsum, pyrophyllite, and vanadium, 20%; soapstone, steatite, and talc, 18%; amphibolite, calcite, feldspar, quartz, and wollastonite, 15%; phosphate rock, above 25% P_2O_5 content, 12.5%; china clay (including ball clay and white shale), white clay (processed, including washed), fire clay, and other minerals (agate, corundum, diaspore, felsite, fuschite-quartzite, jasper, kyanite, perlite, pyroxenite, rock salt, and selenite), 12%; diamond, 11%; columbite-tantalite, ruby, molding sand, quartzite, and silica sand, 10%; fluorspar, china clay (including ball clay and white shale), and white clay (crude), 8%; tin, 7.5%; phosphate rock, up to 25% P_2O_5 content, 6%; barite, 6.5%; garnet, crude mica, waste mica, and scrap, 4%; magnesite, 3%; apatite and vermiculite, 5%; sillimanite, 2.5%; and brown ilmenite, pyrite, and uranium, 2% (Mineweb, 2014; Press Information Bureau, 2014).

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[1] Does not include U.S. production.

The Government created several types of free trade zones—Special Economic Zone (SEZ), Export Processing Zone (EPZ), Software Technology Park (STP), and Export Oriented Unit (EOU)—to encourage production of exports. The Government also planned to establish 16 additional types of free trade zones, the National Industrial and Manufacturing Zones (NIMZs), to increase the share of manufacturing in the GDP to 25% and to create new job opportunities. Eight of the 16 NIMZ were expected to be established along the Delhi-Mumbai Industrial Corridor (DMCI) with the help of the Government of Japan. The DMCI project would cross the States of Gujarat, Haryana, Madhya Pradesh, Maharashtra, Rajasthan, and Uttar Pradesh along Indian's Railways Western Dedicated Freight Corridor. The other seven free trade zones were expected to be established in the cities of Bidar, Gulbarga, Kolar, Nagpur, and the Districts of Chittoor, Medak, and Tumkur. Companies that wanted to operate in an NIMZ would be able to obtain Government approvals for all clearances at one site (U.S Department of State, 2013, p. 14, 15; Hindu, The, 2014b).

Production

The production of fluorspar increased by 61%; ferromanganese, 49%; quartz and quartzite, 47%; wollastonite, 32%; phosphate rock, 30%; aluminum (primary), bromine, and copper (smelter), 24% each; silicomanganese, 6%; direct-reduced iron, 21%; chromium (chromite, gross weight), 20%; graphite, 19%; sand (other), 17%; garnet, 14%; kyanite, 13%; semimanufactures, 12%; manganese (ore and concentrate, gross weight), 11%; lead (metal refined, primary) and sillimanite, 8% each; mica (crude), steel (crude), and vermiculite, 7% each; kaolin (crude), 6%; and dolomite, 29% (table 1).

In 2014, the production of pyroxenite decreased by 81%; cobalt, 66%; agate, 50%; tin, 40%; asbestos, 33%; ilmenite and rutile, 27% each; felsite, 23%; salt (total), and silver (smelter), 15% each; kaolin (processed) and slate, 14% each; zinc (mine output), 11%; barite, cadmium, steatite (soapstone), and zinc (metal), 8% each; chalk and magnesite, 7% each; natural gas and sulfur (byproduct from petroleum), 6% each; and iron ore (gross weight) and refined copper, 5% each (table 1). Data on mineral production are in table 1.

Structure of the Mineral Industry

In 2014, 3,722 mines reported production compared with 3,978 (revised) in 2013. Of the 3,722 operating mines, 661 were located in the State of Andhra Pradesh; 557, in Rajasthan; 464, in Gujarat; 364, in Madhya Pradesh; 354, in Tamil Nadu; 257, in Jharkhand; 202, in Chhattisgarh; 187, in Karnataka; 180, in Odisha; 163, in Maharashtra; 122, in West Bengal; and 211, in the remaining States. Total employment in the mining industry was estimated to be 49 million in 2014 compared with 50 million in 2013, of which 29% were employed in the production of iron ore; 16%, limestone; 11%, manganese ore; 5% each, bauxite, chromite, lead, and zinc; 3% each, dolomite, gold, and garnet (abrasive); 2% each, copper, feldspar, kaolin, quartz, sillimanite, and steatite; and 1% each, barite, chalk, laterite, magnesite, phosphorite, pyrophyllite, and silica sand (table 2; Indian Bureau of Mines, 2014i, p. x; 2014o, p. 1; Ministry of Mines, 2014a, p. 12). Table 2 is a list of major mineral industry facilities.

India's Steel Policy (2005), which was implemented in 2013, allowed private companies to invest in the iron and steel sector, which was previously reserved for public sector investment. The country's steel policy allowed technology to be imported and also allowed private companies to modernize and expand existing sectors and to construct new, cost-effective greenfield plants (Ministry of Steel, 2015).

In 2014, the Government approved the sale of a 10% share of Coal India Ltd. (CIL), an 11.36% share of National Hydroelectric Power Corp. (NHPC), and a 5% share of Oil and Natural Gas Corp. (ONGC) to private companies. The partial sale of these three major state-owned companies was expected to reduce India's fiscal deficit to 4.1% of GDP by 2015. The sale was expected to be offered by Bank of America Merrill Lynch, Credit Suisse, Deutsche Bank, and Goldman Sachs (Crabtree, 2014; Hindustan Times, 2014; Kumar and Das, 2014).

Mineral Trade

The total value of India's exports increased by 2% to $321 billion in 2014 from $315 billion (revised) in 2013. The total value of imports decreased to $463 billion in 2014 from $465 billion (revised) in 2013 (United Nations Conference on Trade and Development, 2015, p. 4–5).

In 2014, India was the world's leading consumer of gold; the consumption in gold jewelry and for investment totaled 842.7 metric tons (t). Imports of gold declined in 2014. According to the Ministry of Finance, the decision to reduce the duty on gold imports to 2% from 10%, was expected to be announced by February 2015. In 2014, imports of nonmonetary and monetary gold were 661,715 kilograms (kg) compared with 1,000 t in 2013. Exports of nonmonetary and monetary gold totaled 70,721 kg in 2014 compared with 85,349 kg in 2013. The Government increased import duties on gold bullion to 10% from 1% in 2012, and required the importers to reexport 20% of the gold brought into the country in 2012 in order to protect the interests of small artisans and the domestic industry (tables 3, 4; Hindu, The, 2013; Sahu and Mukherji, 2014; Roy and Agarwal, 2015).

In 2011, the Government imposed a 30% tax on exports of iron ore fines and lumps, and in 2014, it added a 5% tax on exports of iron ore pellets in order to make raw material available for domestic steelmakers. The tariff caused a decrease in the volume of iron ore exports to China (Thomson Reuters, 2014).

The Federation of Indian Chambers of Commerce and Industry proposed a 10% tax on bauxite exports in 2013, to discourage exports of bauxite and to increase it availability for domestic aluminum producers. In 2013, exports of bauxite increased to 4.2 million metric tons (Mt) from 401,000 t in 2012, of which 91% was exported to China. In 2014, India increased the export tariff on bauxite exports to 20%, and exports decreased to 3.5 Mt. China imported 84% of bauxite from India (table 3; India Bureau of Mines, 2013a, p. 13; Economic Times, The, 2014a, b; Mukherji, 2014).

In 2014, India was the third-leading coal importer in the world. Owing to low domestic production of coal and increased domestic demand, imports of coal increased by 14% to 166 Mt in 2014 from 146 Mt in 2013 (table 4; Das, 2015).

India met its demand for potash through imports. The country was the second-ranked importer of potash after China. In 2014, India's potash imports increased by 60% to 3.4 Mt from 2.1 Mt in 2013. Indian Potash Ltd. was the leading potash importer in the country, and Zauri Agro Chemicals Ltd. was the second largest importer (table 4; Mukherji, 2013).

India had a limited supply of crude oil and natural gas, and it had to import more than 75% of its domestic consumption. Most imports came from the Middle East, and India was the second-ranked importer of oil from Iran. Owing to sanctions against Iran, India's oil imports decreased by more than 40% during the first 5 months of 2013. In June 2014, despite the easing of sanctions on Iran, the United States announced that India should wait until the final nuclear agreement with Iran was completed, and suggested that India would have to make an effort to substantially reduce its oil imports from Iran. In 2013, Iraq replaced Iran as the secondary supplier of crude oil to India; Saudi Arabia provided 20% of total crude oil imports to India, and Iraq provided 14%. Other suppliers of crude oil were Venezuela, 12%, and Oman, 9%. In 2014, India was concerned about the instability in Iraq, which could decrease India's oil imports and hamper the country's economic development (Oilprice.com, 2013; Thomson Reuters, 2013; Bhandari, 2014; Brics Post, The, 2014; Mashru, 2014; U.S. Energy Information Administration, 2014, p. 10; Gupta, 2015; Ministry of Petroleum and Natural Gas, 2015, p. 5).

India's exports to the United States were valued at $45.2 billion in 2014 compared with $41.8 billion in 2013. Of this amount, gem diamonds accounted for $7.6 billion; petroleum products, about $3.4 billion; fuel oil, $1.4 billion; iron and steel products, $456 million; other gemstones, $347 million; stone, sand, and cement, $325 million; chemical fertilizer, $273 million; iron and steel, advanced, $187 million; bauxite and alumina, $79 million; sulfur, $24 million; nonmetallic minerals, $50 million; nonferrous metals, $40.2 million; other precious metals, $7 million; liquefied petroleum gas, $3 million; nickel, $2 million; nonmonetary gold, $373,000; coal and related fuels, $300,000; tin, $186,000; copper, $177,000; and zinc, $9,000. In 2014, India's imports from the United States were valued at $21.6 billion compared with about $21.8 billion in 2013. Imports included gem diamonds, $3.7 billion; nonmonetary gold, $1.2 billion; petroleum products, $910 million; chemical fertilizers, $508 million; metallurgical-grade coal, $320 million; steelmaking materials, $269 million; nonferrous metals, $114 million; aluminum and alumina, $133 million; other iron and steel products, $94 million; copper, $88 million; precious metals, $88 million; iron and steel mill products, $76 million; natural gas liquids, $64,000; coal and fuels, $32 million; nonmetallic minerals, $17 million; fuel oil, $11 million; and nuclear fuel materials, $8.9 million (U.S. Census Bureau, 2014a, b).

Commodity Review

Metals

Bauxite and Alumina and Aluminum.—The major companies involved in the mining of bauxite were Ashapura Minechem Ltd., Bharat Aluminum Co. Ltd. (BALCO), Bombay Minerals Ltd., Dr. Nirmalaben Mehta, Gujarat Mineral Development Corp. Ltd. (GMDC), Hindalco Industries Ltd. (Hindalco), National Aluminium Co. Ltd. (NALCO), Prabhudas Vithaldas, Pravin Kumar Ghosalia, Pushpaben Prabhudas Mkhecha, and Utkal Alumina International Ltd. In 2014, the State of Odisha was the leading bauxite producer and accounted for 35% of total production; followed by Gujarat, 32%; Jharkhand, 11%; Maharashtra, 9%; Chhattisgarh, 6%; Madhya Pradesh, 3%; and Goa, Karnataka, and Tamil Nadu contributed the remaining 3% (table 2; Indian Bureau of Mines, 2014c, p. 5).

In 2014, NALCO remained the leading bauxite producer. It operated the Panchpatmali bauxite mine at the industrial town of Damanjodi, Koraput District, in the State of Odisha. Panchpatmali had a production capacity of 6.3 Mt/yr of bauxite. NALCO planned to increase the mine's capacity to 6.8 Mt/yr (date unspecified). The Panchpatmali Mine contributed 29% of India's total bauxite production, which was used for alumina production at NALCO's refineries (Indian Bureau of Mines, 2014c, p. 2, 10; 2014i, p. x; Ministry of Mines, 2014b, p. 3; 2015, p. 80; National Aluminum Co. Ltd., 2015c).

BALCO operated two bauxite mines, two powerplants, and refining and smelting facilities. Vedanta Ltd. (formerly known as Sesa Sterlite Ltd.), held a 51% share in BALCO, and the remaining 49% was held by the Government. In 2014, Vedanta Aluminium Ltd. (VAL), a wholly owned subsidiary of Vedanta Ltd. entered into a joint-venture agreement with Orissa Mining Corp. Ltd. (OMCL) and South West Orissa Bauxite Mining Pvt. Ltd. (SWOBM) for bauxite production at the Niyamgiri project in the State of Odisha. The Niyamgiri project was a source of bauxite supply for the alumina refinery at Lanjigarh. The request for forest clearance was rejected by the Ministry of Environment, Forest, and Climate Change owing to environmental concerns by the State of Odisha (Sesa Sterlite Ltd., 2013; 2014, p. 250).

GMDC was a State-owned company in which the State of Gujarat held 75% interest and 25% was distributed through private and institutional investors. In 2014, GMDC operated one calcined bauxite mine and two bauxite projects—the Gadhsisa Mine in Kutch District, the Bhatia project in Jamnagar District, and the Ratadia project in Kutch District. In 2014, GMDC signed a lease deed agreement with the district collector for the Mewasa Mine bauxite project; the exact date for commencement of mining was undetermined. GMDC, as a joint venture with Credo Mineral Industries Ltd., commissioned the beneficiation of a low-grade bauxite facility for which GMDC would supply the bauxite (Gujarat Mineral Development Corp., 2014, p. 9–10, 17).

The major alumina and aluminum producers in India were BALCO, Hindalco, Madras Aluminium Co. Ltd. (MALCO), NALCO, and VAL. Production of aluminum increased to 2.1 Mt in 2014 from 1.7 Mt in 2013 in response to domestic demand from construction, power, transportation, and other sectors. In 2014, 48% of the country's output of aluminum was consumed by the power sector, 15% by the transportation sector, and 13% by the construction sector (Indian Bureau of Mines, 2014a, p. 2; Srinivasan, 2014).

Hindalco, which was 33% owned by Aditya Birla Group, 26% by foreign investors, 23% by private Indian investors, and 18% by financial institutions, made significant progress on the Utkal alumina greenfield project. The Utkal project was operated by Utkal Alumina International Ltd. (UAIL), which was a wholly owned subsidiary of Hindalco. In 2014, after a 21-year delay owing to concerns by environmental groups, UAIL operated its refinery and produced 277,000 t of alumina. The production capacity of the refinery was 1.5 Mt/yr of alumina. The bauxite for Utkal refinery came from the Baphimali bauxite mine, which had reserves estimated to last for 25 years. The alumina produced by UAIL would be used at the Aditya and Mahan smelters (Mohanty, 2013; Indian Bureau of Mines, 2014a, p. 5; Hindalco Industries Ltd., 2013, p. 4, 14–15; 2014a, p. 10; 2014b).

The Muri alumina refinery, which was located on the bank of the Subarnarekha River in the village of Chhotamuri, experienced a water shortage. The refinery depended on the Subarnarekha River for its water supply and, owing to low rainfall during the summer season, the river's water level dropped and it became insufficient for withdrawal. The production capacity of the Muri refinery was 450,000 metric tons per year (t/yr) of alumina and hydrates. At the Belgaum alumina refinery, which was located in the State of Karnataka, the production capacity increased to 350,000 t/yr of alumina hydrates. In 2014, Hindalco planned to increase production capacity at the Belgaum alumina refinery to 650,000 t from 350,000 t, however, the plan was put on hold as the company waited for Government approval for bauxite mining (Indian Bureau of Mines, 2014a, p. 4, 5; Hindalco Industries Ltd., 2013, p. 4, 14–15; 2014a, p. 10; 2014b, c).

In 2014, NALCO, a state-owned company of the Navratna Central Public Sector Enterprise under the Ministry of Mines, was the leading producer of alumina in India and accounted for 51% of the country's alumina production. The company upgraded the fourth line at its Damanjodi refinery, which increased the production capacity to 2.1 Mt/yr in 2014. NALCO planned to add 1 Mt/yr of production capacity at each of its greenfield alumina refineries in the Sundergarh District, State of Odisha, and in the Kutch District, State of Gujarat. GMDC would supply bauxite for the alumina refinery in the Kutch District (Indian Bureau of Mines, 2014a, p. 5; National Aluminium Co. Ltd., 2014, p. 56; 2015a–c).

VAL operated a 1-Mt/yr alumina refinery at Lanjigarh in the Kalahandi District, State of Odisha, and a 500,000-t/yr aluminum smelter in Jharsuguda District, State of Odisha. In 2014, VAL planned to increase production capacity at its alumina refinery at Lanjigarh in the Kalahandi District, State of Kalahandi, to 200,000 t/yr from 100,000 t/yr of alumina; however, it was awaiting government approval to increase production. VAL also planned to construct a 300,000-t/yr capacity refinery at an unspecified location, however, the project was on hold awaiting government approval. The construction of an alumina smelter in Jharsuguda, Odisha, was in progress in 2014 (Indian Bureau of Mines, 2014a, p. 6).

Hindalco also made significant progress on its greenfield projects—the Aditya aluminum project in the State of Odisha, the Mahan aluminum project in the State of Madhya Pradesh, and the Jharkhand aluminum project in the State of Jharkhand. The Aditya aluminum project was located at Lapanga, Sambalpu District, in the State of Odisha, and consisted of a powerplant and a smelter with the capacity to produce 360,000 t/yr of aluminum. The Mahan aluminum project is located at Bargawan, in the State of Madhya Pradesh, and consisted of a 360,000-t/yr-capacity smelter and a powerplant. In 2014, the Mahan aluminum smelter produced 54,000 t of aluminum (Mohanty, 2013; Indian Bureau of Mines, 2014a, p. 5; Hindalco Industries Ltd., 2013, p. 4, 14–15; 2014a, p. 10; 2014b).

In 2014, Hindalco operated two aluminum smelters—the Renukoot smelter in the State of Uttar Pradesh and the Hirakud smelter in the State of Odisha. A third smelter owned by Hindalco at Alupuram, Kerala District, remained closed in 2014. Hindalco expanded its major manufacturing facilities through brownfield projects at the Hirakud smelter. Hirakud upgraded its horizontal-stud Søderberg smelter (HSS) technology to modern, environmentally friendly pre-brake smelter technology in 2013 (the first smelter in India to have done so). Owing to the plant modernization in 2014, the capacity of the Hirakud smelter increased to 217,000 t/yr from 161,400 t/yr. In 2014, NALCO increased the production capacity at its Angul aluminum smelter in the State of Odisha to 567,000 t/yr from 460,000 t/yr (Indian Bureau of Mines, 2014a, p. 4, 5; Hindalco Industries Ltd., 2013, p. 4, 14–15; 2014a, p. 10; 2014b, c; National Aluminium Co. Ltd., 2014, p. 56; 2015a–c).

BALCO planned to modernize and expand the capacity of the Korba aluminum smelter in 2015 to 670,000 t/yr from 345,000 t/yr by adding a new 325,000-t/yr-capacity Korba-III smelter. The Korba-I, which had a capacity of 100,000 t/yr, was shut down in 2014 (Sesa Sterlite Ltd., 2013).

Chromium.—Almost all chromite production was in the States of Odisha and Karnataka in 2014, and the State of Odisha was the leading chromite producer. Chromite was produced by six companies—Balasore Alloys Ltd., Ferro Alloys Corp. Ltd. (FACOR), Indian Metals & Ferro Alloys Corp. Ltd. (IMFAL), Orissa Mining Corp. Ltd. (OMC), Jindal Stainless Ltd. (JSL), and Tata Steel Ltd. (Tata Steel)—all located in the State of Odisha. Mysore Minerals Ltd., which was state-owned, was the only chromite producer in the State of Karnataka. Tata Steel planned to increase its production capacity by 600,000 t/yr of ferrochrome by developing an underground mine at the Sukinda Mine, which is located in the State of Odisha. The mining license for the Sukinda Mine expired on January 12, 2013; since the expiration, Tata Steel operated the mine with a deemed extension permit (meaning that the operation was permitted to operate at one-half of the capacity). In 2014, the environmental clearance for the Sukinda Mine was extended until March 2026, with a limited production capacity of 351,000 t/yr of chromite. IMFAL stopped operations at the Mahagiri chromite mines in October 2013, because the company failed to meet certain conditions required by the Ministry of Environment, Forest, and Climate Change. The mine was operated as an opencast and underground mine. In 2014, the environmental clearance for the Mahagiri chromite mines was extended until January 2015;

however, the approval for forest clearance was not obtained. In January 2013, IMFAL recommissioned the Nuasahi underground chromite mine following an order of the Orissa High Court, and in 2014, IMFAL applied for environmental clearance for the Nuasahi underground mine (Balasore Alloys Ltd., 2013, p. 6–8; MoneyWorks4me, 2013; Ferro Alloys Corp. Ltd., 2014; p. x; Indian Metals & Ferro Alloys Ltd., 2014a, p. 1; 2014b, p. 1; 2014c; 2014d, p. 15; Ministry of Mines, 2014a, p. 19).

Copper.—In 2014, the leading state producer of copper concentrate was the State of Madhya Pradesh, which accounted for 57% of the country's total copper concentrate production, followed by Rajasthan, 33%; and Jharkhand, 10%. Government-owned Hindustan Copper Ltd. (HCL) was the only producer of primary refined copper to use output from its mines and from imported copper concentrates. Hindalco (a subsidiary of Birla Copper), Jhagadia Copper Ltd., and VAL were privately owned companies and mainly used imported copper concentrates. In 2014, HCL operated the Indian Copper Complex (ICC) in Ghatsila, East Singhghum District, the State of Jharkhand; the Khetri Copper Complex (KCC) in Khetrinagar, Jhunjhunu District, in the State of Rajasthan; the Malanjkhand copper project (MCP) at the Malanjkhand Copper Complex Mines in Balaghat District, the State of Madhya Pradesh; and the Taloja copper project (TCP) in the State of Maharashtra. KCC consisted of two underground mines, Khetri and Kolihan, and a beneficiation plant. HCL began the development of the Banwas Mine in the State of Rajasthan in May 2010, which was scheduled to be completed in 2015. HCL's Khetri and Kolihan Mines planned to expand their total production capacity to 3.1 Mt/yr from 1.0 Mt/yr of ore. The expansion project at the Khetri and Kolihan Mines started in September 2011, however, the completion date was unspecified. The MCP consisted of four copper deposits—Garhi Dongri, Gidhri Dhori, Jatta, Malanjkhand, and Shitalpani. HCL planned to increase Malanjkhand's production capacity to 5 Mt/yr from 2 Mt/yr of ore by developing an underground mine below the open pit mine. The project was expected to be commissioned after the company obtained the required clearance from the Standing Committee of the National Board for Wildlife. In 2014, HCL planned to resume operations at its closed Kendadih and Rakha Mines at Singhbum in ICC, which had production capacities of 1.5 Mt/yr of ore and 210,000 t/yr of ore, respectively, as soon as the environmental clearance was obtained. The Surda Mine at the ICC was operated by India Resource Ltd. through an alliance with HCL. In September 2014, the State government of Jharkhand ordered HCL to stop operations at the Surda Mine while awaiting the renewal of its mining license. In November 2014, the High Court of Jharkhand ordered HCL to obtain environmental clearance for the Surda Mine (Hindustan Copper Ltd., 2014, p. 15; Indian Bureau of Mines, 2014e, p. 14–18; India Resources Ltd., 2015).

In 2013, the Tamilnadu Pollution Control Board (TNPCB) ordered VAL to close the Tuticorin copper smelter. The company filed an appeal against the TNPCB's order with the National Green Tribunal (NGT). In the first quarter of 2014, the smelter was closed, but the NGT was allowed to resume operations at the Tuticorin smelter after a report was submitted by an expert committee. The TNPCB filed the appeal against the NGT with the Supreme Court of India; the date of the hearing was unspecified (Sesa Sterlite, 2014, p. 250).

Gold.—In 2014, almost all the gold produced in India came from the State of Karnataka, which accounted for 99% of total production. The remaining production of gold was from the State of Jharkhand. Production of gold was reported by the only public company, Hutti Gold Mine Ltd. (HGML), which was located in the State of Karnataka; Manmohan Mineral Industries (Pvt.) Ltd., which was the private sector that operated the underground Kunderkocha gold mine in Singhbhum East District in the State of Jharkhand; and by Hindalco (BCC and ICC) and NMDC (Indian Bureau of Mines, 2014g, p. 13).

In 2014, HGML operated three gold mines (the Heera-Buddini, the Hutti, and the Uti Mines in Raichur District in the State of Karnataka), and remained the leading producer of primary gold in India. The Uti Mine, which was an open pit mine in the northern part of the licensed area, had a production capacity of 25,960 t/yr of ore. HGML submitted a proposal to the government of Karnataka to establish an open pit mine in the southern part of the licensed area, and it was conducting exploratory development of underground mines at the Uti and Hutti Mines. Deccan Gold Mines Ltd. (DGML) conducted exploratory work in the Hutti-Maski Belt at various prospects, including the Hutti North and Hirenagnur prospects, the southern and northern continuation of the Uti Mine lodes, and other prospects. DGML created a joint venture with JB Group to evaluate the available data and to select an area for exploration study. In 2014, the joint venture conducted detailed geologic mapping and channel sampling and identified five subparallel zones of gold mineralization in the Hesaba and Asaleyta prospects in Dgibouti (Indian Bureau of Mines, 2014g, p. 13–15).

In 2014, KGF proposed the acquisition of the state-owned Bharat Gold Mines Ltd. (BGML) assets, and the tender process was expected to be finalized in 2015. In 2013, the Ministry of Mines decided to tender BGML, which operated the Kolar Gold Field (KGF) in the State of Karnataka, the Bisanatham Mine and the Chigaragunta Mine in Chittoor District, and the Ramagiri Mine in Anantapur District in the State of Andhra Pradesh. In 2001, BGML abandoned some mining operations owing to high operational costs. Vedanta Resources plc of the United Kingdom planned to expand its production and considered bidding for BGML (Agrawal, 2013; Bhayani and Taneja, 2013; Kolar Gold Ltd., 2014, p. 4; Singh, 2013).

In August 2013, Kolar Gold Ltd. of the United Kingdom announced that Jonnagiri's mining license was awarded to its partner Geomysore Services India (Pvt.) Ltd. (GMSI), which was a joint venture between Australian Indian Resources of Australia (80%) and Sun Mining and Exploration Ltd. (20%). The Jonnagiri project was located in Kurnool District in the State of Andhra Pradesh and was divided into two blocks—the Dona East block and the Dona Temple block. The Joint Open Reserves Committee-compliant estimate of the total resources of the project was 22,000 kg of gold. The open pit resources at the Dona East block were estimated to have a grade of 2.1 grams per metric ton (g/t) gold and contain 5,900 kg gold (reported as 190,000 troy ounces), and the underground resources were estimated to have a grade of 4.3 g/t gold and contain 16,500 kg of gold (reported as 530,000 ounces). Thriveni Earth Movers Ltd. (Thriveni), a mine developer and operator, agreed to invest in the Jonnagiri drilling program (Kolar Gold Ltd., 2013; 2014, p. 3, 5, 6).

Iron Ore and Iron and Steel.—Iron ore production decreased to 129.8 Mt in 2014 from 136.1 Mt in 2013 and 152.6 Mt in 2012. The decrease in iron ore production was a consequence of the Supreme Court's ban on iron ore mining in 2011, and the lengthy processes for renewing mining licenses and issuing environmental and forest clearance approvals. In 2011, the Supreme Court suspended iron-ore mining activities in the States of Karnataka and Goa because of illegal mining activities that were producing negative environmental effects. In April 2013, the Supreme Court lifted the ban on 63 mines in the State of Karnataka, including one with a capacity of 2.3 Mt/yr; however, many iron ore mines remained closed because they could not meet the Government's environmental standards. In 2014, the Supreme Court lifted the ban on mining iron ore in the State of Goa and allowed production of 20 Mt/yr of iron ore. The Supreme Court announced that it would not issue mining licenses for areas within a 1-kilometer radius of national parks and wildlife sanctuaries, and ordered the Ministry of Environment, Forest, and Climate Change to identify the ecologically sensitive areas around national parks (Komnenic, 2013; Siddiqui, 2013; Business Standard, 2014; Indian Express, The, 2014; Mininstry of Steel, 2014, p. 2; Sesa Sterlite Ltd., 2015).

In 2014, the State of Odisha remained the leading producer of iron ore in India and accounted for 50% of the country's total iron ore production, Chhattisgarh, 19.8%; Jharkhand, 14.8%; Karnataka, 12%; and Andhra Pradesh, Madhya Pradesh, Mahrashtra, and Rajasthan, 3.4% (combined). In 2014, Goa did not report any iron ore production owing to the Supreme Court's suspension of mining operations (Indian Bureau of Mines, 2014j, p.xii; 2014l, p. 3).

In 2014, NMDC (a state-owned company) continued to explore for minerals and developed mines to supply iron ore for the steel industry. NMDC also continued to operate large iron ore mines at Bailadila in the State of Chhattisgarh and at Donimalai in the State of Karnataka. The company continued to diversify its resources and to set up an integrated steel plant with a production capacity of 3 Mt/yr of steel at Nagarnar, Bastar District, in the State of Chhattisgarh. It also planned to construct a 1.2-Mt/yr pellet plant at Donimalai in the State of Karnataka, a 360,000-t/yr banded hematite jasper ore beneficiation plant at Donimalai, a 2-Mt/yr pellet plant at Nagarnar, and a 2-Mt/yr beneficiation plant at Bacheli that would be connected by a slurry pipeline between Bacheli and Nagarnar in the State of Chhattisgarh. NMDC signed a memorandum of understanding (MOU) with the Indian Railway for the Jagdalpur-Karindul section of the Kottavasla-Kirandul line of the East Coast Railway to deliver iron ore from Bailadila (Ministry of Steel, 2013, p. 8; 2014, p. 22–23).

In 2013, the Steel Authority of India Ltd. (SAIL) received "final forest clearance" approval for the Barsua and the Bolani iron ore mines, and in 2014, it received stage-1 forest and environmental clearance from the Ministry of Environment, Forest, and Climate Change to expand iron-ore capacity at the Gua iron ore mines. The Government of Odisha's approval of the technical committee's report on the Karo-Karampada Elephant Corridor allowed SAIL to increase the production capacity of the Bolani Mine to 10 Mt/yr of iron ore. The Barsua and Kalta Mines in Odisha operated under deemed extension (Indian Bureau of Mines, 2013c, p. 14, 15; 2014k, p. 14; Steel Authority of India Ltd., 2013, p. 2; 2014, p. 8, 9).

In 2014, India ranked fourth in world production of crude steel after China, Japan, and the United States. In 2014, India's production of steel increased by 7% to 87 Mt from 81 Mt. SAIL operated five steel plants (the Bhilai steel plant in the State of Chhattisgarh, the Rourkela steel plant in the State of Odisha, the Durgapur steel plant in the State of West Bengal, the Bokaro steel plant in the State Jharkhand, and the Indian Iron and Steel Company (IISCO) steel plant at Burnpur in the State of West Bengal). SAIL also operated three alloy steel plants (the plant at Durgapur in the State of West Bengal, the plant at Salem in the State of Tamil Nadu, and the Visceswaraya iron and steel plant at Bhadravati in the State of Karnataka), and several Visakhapatnam steel plant (Vizag Steel) units located at Visakhapatnam in the State of Andhra Pradesh. In 2014, SAIL increased the combined production capacity at five of its steel plants to 23.5 Mt/yr from 14.4 Mt/yr. The modernization and capacity expansion plan included the commissioning of a new sinter plant at the Rourkela steel plant; the installation of an Air Separation Unit-4 and an Oxygen Plant-II at Bhilai steel plant; and the installation of a raw material processing plant, a sinter plant, a coke oven battery-II, and a wire-rod mill at the IISCO steel plant at Burnpur. In 2014, SAIL commenced the operation of a new steel plant at Burnpur with a production capacity of 2.5 Mt/yr of steel (Indian Bureau of Mines, 2013c, p. 14, 15; 2014k, p. 14; Steel Authority of India Ltd., 2013, p. 2; 2014, p. 8, 9; World Steel Association, 2015, p. 2).

In 2014, Rashtriya Ispat Nigam Ltd. (RINL), a Navaratna (which is a public sector enterprise) was in the process of increasing the production capacity of Vizag Steel to 6.3 Mt/yr from 3.0 Mt/yr. According to an MOU between RINL and NMDC that was signed in 2013, the NMDC supplied iron ore through a pipeline from its Bailadila complex in the State of Chhattisgarh from Jagdapur to Vizag steel in the State of Andhra Pradesh. RINL also planned to obtain iron ore from its subsidiary Orissa Mineral Development Corp. Ltd. (Indian Bureau of Mine, 2014m, p. 15–16; Ministry of Steel, 2013, p. 8; Rashtriya Ispat Nigam Ltd., 2013, p. 25; 2014, p. 9).

Lead and Zinc.—Hindustan Zinc Ltd. (HZL) produced primary lead and zinc and accounted for 98% of India's total production of zinc metal; Binani Zinc Ltd. produced the remaining 2%. HZL operated the Dariba smelting complex, the Chanderiya lead and zinc smelter, and the Debari zinc smelter. The Dariba smelting complex had a hydrometallurgical zinc smelter with a processing capacity of 210,000 t/yr of zinc and 100,000 t/yr of lead. The Chanderiya lead and zinc smelter included a pyrometallurgical smelter with a processing capacity of 105,000 t/yr of zinc and a hydrometallurgical smelter with a processing capacity of 420,000 t/yr of zinc. The Debari zinc smelter included a hydrometallurgical zinc smelter with a processing capacity of 88,000 t/yr of zinc. Binani Zinc Ltd., which was a subsidiary of Binani Industries Ltd. (89.9%), operated a smelter at Kochi in Ernakulam District in the State of Kerala with a capacity of 38,000 t/yr of zinc metal. The Tundo lead smelter was closed for economic reasons in 2013 (Hindustan Zinc Ltd., 2013, p. 21, 23; 2014, p. 9).

The Rampura Agucha Mine, which operated as an opencast lead-zinc mine with HZL, had a production capacity of 6.15 Mt/yr of ore. HZL expected to start production at its underground mine with a production capacity of 3.75 Mt/yr of ore. The Rampura Agucha Mine reserves were estimated to be 57.5 Mt grading at 13.7% zinc and 1.8% lead. HZL also operated three underground mines—the Rajpura Dariba Mine, the Zawar Mine, and the Sindesar Khurd Mine. The Rajpura Dariba Mine's production capacity was 900,000 t/yr of zinc ore, and HZL planned to increase its production capacity by 33% to 1.20 Mt/yr. The reserves at the Rajpura Dariba Mine were estimated to be 10.0 Mt grading 6.4% zinc and 1.6% lead. The reserves at Sindesar Khurd Mine were estimated to be 20.4 Mt grading 4.6% zinc and 2.6% lead. Since 2010, operations at three of the four mines at the Zawar complex were suspended as the company waited for forest clearance approval from the Ministry of Environment, Forest, and Climate Change. The reserves at the Zawar mining complex were estimated to be 9.9 Mt grading 3.8% zinc and 1.9% lead. In 2014, HZL developed the new Kayad Mine in the State of Rajasthan. The reserves of Kayad Mine were estimated to be 6.2 Mt grading 10.4% zinc and 1.5% lead. The production capacity of the mine was 350,000 t/yr (Hindustan Zinc Ltd., 2013, p. 21, 23; 2014, p. 8, 18).

Manganese.—In 2014, the leading State producer of manganese ore was the State of Madhya Pradesh, which accounted for 30% of the country's total production; the States of Maharashtra and Odisha, 26% each, the State of Andhra Pradesh, 13%, and the State of Karnataka, 5%. MOIL Ltd. remained the leading producer of manganese ore, followed by Tata Steel, RBSSDP & FN Das, Mangilal Rungta, Orissa Manganese and Minerals Ltd., S.R. Ferro Alloys, and the Sandur Manganese and Iron Ore Ltd. (Indian Bureau of Mines, 2014m, p. 5–6).

MOIL planned to increase production at its mines in 2014. Production at the Balaghat Mine was expected to increase to 420,000 t/yr from 310,000 t/yr by deepening the Holmes shaft to 435 meters (m) from 300 m. The deepening of the Holmes shaft was expected to be completed by 2017. The company planned to sink a 134-m vertical shaft in the Ukwa Mine; the project was expected to be completed by 2015. The company also planned to sink a vertical shaft to 169 m from 109 m to sustain and increase production at the Chikla Mine. MOIL planned to increase production at the Munsar Mine to 125,000 t from 55,000 t of ore by 2021. Production at the Munsar Mine was expected to increase by sinking a 156-m vertical shaft at the central portion of the main ore body; the project was scheduled to be completed in 2015. The sinking of the first vertical shaft at the Gumgaon Mine was completed in 2012, and the sinking of the second vertical shaft to 350 m was expected to be completed by 2018 (MOIL Ltd., 2014, p. 11, 13).

Industrial Minerals

Barite.—In 2014, Andhra Pradesh Mineral Development Corp. Ltd. operated the Mangampeta barite project, which is located in the village of Mangampeta in Cuddapah District. The company remained the only State-owned barite producer in India. The State of Andhra Pradesh accounted for about 94% of India's production of barite; the remaining 6% was produced by 20 private companies (Indian Bureau of Mines, 2014b, p. 2; 2014i, p. xiii). In 2014, owing to allegations of illegal barite mining, the Government of Andhra Pradesh canceled the barite mining licenses in Mangampeta and established a technical committee to tender canceled licenses in a more transparent way (Hindu, The, 2014a; Times of India, The, 2014).

Cement.—In 2014, India ranked second in the world in cement production after China. In 2014, a shortage of coal resulted in the closure of cement plants, including Bheema Cements Ltd. and Panyam Cement and Mineral Industries Ltd. in the States of Andhra Pradesh and Telengana. Production was estimated to have decreased by 8% to 260 Mt from 280 Mt, which accounted for 6.2% of world output (Ambuja Cements Ltd., 2014, p. 14; Global Cement, 2014d, g; UltraTech Cement Ltd., 2014, p. 2).

In 2013, UltraTech Cement Ltd., which was India's leading producer of gray cement, white cement, and concrete mix, acquired the Gujarat Cement Unit of Jaypee Cement Corp. Ltd. (JCLL), a subsidiary of Jaiprakash Associates Ltd. in the State of Gujarat. In June 2013, the cement plant at Sewagram and the grinding unit at Wanakbori, which had a combined capacity of 4.8 Mt, became the company's 12th cement plant and grinding unit. UltraTech also acquired a 57-megawatt powerplant, a jetty for clinker, a desalinization plant, and a cement-bag manufacturing unit. The total capacity of UltraTech's cement plants increased to 58.8 Mt/yr in 2014. UltraTech submitted a letter of intent to the Infrastructure Development Department in the State of Karnataka for the construction of two new cement plants at Tuni in Dehradun District and at Someshwar in Almora District with production capacities of 3.5 Mt/yr and 2 Mt/yr, respectively. No update on the construction of two new cement plants was available at yearend 2014 (Global Cement, 2013d; 2014o; Projects Today, 2013; UltraTech Cement Ltd., 2013; 2014, p. 49).

In January 2013, the operations at Ambuja Cements Ltd. were stopped because a fly ash container crashed into the mixing unit. Holcim India Ltd., which is a subsidiary of Holcim Group of Switzerland, planned to restructure Ambuja Cements Ltd. and ACC Ltd. (formerly known as Associate Cement Co. Ltd.) by combining common functions across the two companies, while keeping the two brands independent. The restructuring was expected to save the company $14.4 million in supply chain and fixed-cost optimization. The integration process was expected to be completed by 2015. In 2014, Ambuja Cement was expected to invest $133 million to increase its production capacity by constructing three greenfield cement plants in the States of Rajasthan, Madhya Pradesh, and Uttar Pradesh, each with a production capacity of 1.5 Mt/yr, and plants with clinker capacity of 800,000 t/yr were constructed in the States of West Bengal and Rajasthan (Global Cement, 2013a; 2014b; 2015).

Dalmia Bharat Cement Ltd. was expected to increase its capacity to 24 Mt/yr after commissioning a greenfield cement plant unit with a capacity of 2.5 Mt/yr at Belgaum in the State of Karnataka; the exact date for the completion of the project was unknown. In 2014, Daima Bharat Cement became the sole owner of Bokaro Jaypee Cement Ltd. in the State of Jharkhand by acquiring the remaining 26% share from the SAIL for $150 million (Global Cement, 2013c; 2014f).

In 2014, JSW Cement planned to construct a greenfield cement plant in Gulbarga in the State of Karnataka, which would have the capacity to produce 4.3 Mt/yr of cement. ACC Ltd. planned to invest $499 million on the modernization of Jamul facilities in the State of Chhattisgarh and to add a grinding unit with a production capacity of 1.5 Mt/yr to its existing unit in the State of Jharkhand. ACC planned to stop production at its existing Jamul plant and to construct a new plant with a production capacity of 4 Mt/yr, which would increase ACC's production capacity to 10 Mt/yr from 6 Mt/yr by 2016. In 2014, Sagar Cement Ltd. (SCL) acquired a 100% stake in BMM Cements Ltd., which operated a 1 Mt/yr cement plant in the State of Andhra Pradesh, and increased its production capacity to 3.75 Mt/yr. Cement Corp. of India Ltd. halted cement production at its Bokajan cement plant in January 2014 owing to a shortage of funds to purchase coal (Global Cement, 2014a, j, k, m, n).

In 2014, Chettinad Cement Corp. Ltd. (CCCL) purchased a 20.58% share of Anjani Portland Cement Ltd. Anjani Portland Cement operated two plants in Nalgona District in the State of Andhra Pradesh with a production capacity of 1.2 Mt/yr, and planned to construct a greenfield cement plant in the State of Karnataka. In 2014, Mangalam Cement Ltd. commissioned a new grinding mill in Kota District in the State of Rajasthan. The total cement production capacity at the plant increased to 3.25 Mt/yr from 2.0 Mt/yr. India Cements Ltd. operated seven cement plants in the States of Tamil Nadu and Andhra Pradesh, one plant in the State of Rajasthan, and two grinding units in the States of Tamil Nadu and Maharashtra. The merger of India Cements with its subsidiary Trinetra Cemt Ltd. would increase the total production capacity of India Cements to 15.8 Mt/yr from 15.5 Mt/yr (Global Cement, 2013b; 2014e, h, l).

India Cements was cited by the State of Andhra Pradesh for failure to meet emission standards, inappropriate storage of limestone in open areas, an inadequate water sprinkler system, and other violations. The Andhra Pradesh Pollution Control Board ordered the closure of India Cements Ltd.'s plant at Yerraguntla and requested an investigation of the company's four cement plants in Kadapa District owing to severe pollution in areas surrounding the plant (Global Cement, 2013b; 2014e, h, l).

Fluorspar.—In 2014, Maharashtra State Mining Corp. Ltd. was the only company in India that operated fluorite mines. Maharashtra State Mining Corp. Ltd. operated the Dongargaon fluorite mine in Chandrapur District. Owing to the high cost of land diversion required by the Ministry of Environment, Forest, and Climate Change, Rajasthan State Mines and Minerals Ltd. gave up three production licenses for the Karara, the Lakhawas-II, and the Tavidar (fluorite) mines in 2013. GMDC operated Kadipani, the largest fluorspar project in Baroda District in 2013. The mining was done by opencast method. GMDC (50%) in a joint venture with Swarnim Gujarat Fluorspar Pvt. Ltd. (50%) planned to construct a fluorite beneficiation plant with a capacity of 40,000 t/yr at Kadipani in Vadodara District (Rajasthan State Mines and Minerals Ltd., 2012, p. 5; Gujarat Mineral Development Corp. Ltd., 2013, p. 14, 30, 38; Indian Bureau of Mines, 2014f, p. 5; Maharashtra State Mining Corp. Ltd., 2014).

Gypsum.—In 2014, owing to the insufficient supply of domestic gypsum to meet the country's increased demand, the Indian cement companies had to invest in gypsum mines in Iran, Oman, and Thailand, and in the production of synthetic gypsum. In 2014, the State of Rajasthan remained the country's leading producer of gypsum and accounted for 99% of the country's production. The States of Gujarat, Jammu, Kashmir, and Tamil Nadu contributed the remaining 1%. At yearend 2014, the minable reserves of gypsum in India increased to 150 Mt from 140 Mt, of which 125 Mt were available to the cement industry, which was enough to supply the cement industry for 7 to 8 years. Thirty gypsum mines were operated by State-owned Rajasthan State Mines and Minerals and FCI Aravali Gypsum & Minerals India Ltd. (FAGMIL), which was formerly part of the Fertilizer Corporation of India Ltd. In 2013, FAGMIL obtained two new gypsum mining licenses for the Kishanpura A and the Kishanpura B properties, each of which had a capacity of 50,000 t/yr. Owing to the gradual depletion of the country's high-grade gypsum resources and to increased production, FAGMIL applied to the Rajasthan State Government for permission to enhance the capacity of the two mines in Padampura and Dhandra. The Padampura Mine is located in the Sri Gangangar District in the State of Rajasthan, and was a part of the Surtagarh group of mines. The lease area of the Padampura Mine was 120 hectares, and it had the capacity to produce 15,000 t/yr of gypsum. The Dhandra Mine is located in the Sri Ganganagar District in the State of Rajasthan, and it was a part of the Rmsinghpur group of mines. The lease area of the Dhandra Mine was 132 hectares, and it had the capacity to produce 35,000 t/yr of gypsum (FCI Aravali Gypsum and Minerals India Ltd., 2013, p. 5, 6; 2015a, b; Global Cement, 2014c; Indian Bureau of Mines, 2014h, p. 4; 2014i, p. xiii).

Mineral Fuels and Related Materials

Coal.—In 2014, coal remained the leading source of energy in India for manufacturing and for the production of bricks, cement, chemicals, fertilizer, steel, and textiles, and it was expected to remain important until 2032. About 76% of India's coal output was consumed by power sector producers. The demand for coal from the domestic market, especially electricity generation, was increasing; however, new coal projects were delayed owing to the long permitting process required by the Ministry of Environment, Forest, and Climate Change (Das, 2014; Eastern Coalfields Ltd., 2014, p. 4; Indian Bureau of Mines, 2014d, p. 2, 14–15, 31).

Coal India Ltd., a state-owned company, decided to invest in overseas assets in 2014 to fill the demand gap, which made India the world's third leading importer of coal. In 2014, the Government planned to break up Coal India Ltd. and open the coal production industry to foreign investors to increase output, reduce imports, and auction coal blocks through open tenders. The State of Chhattisgarh remained the leading coal-producing State in the country; it accounted for 22.5% of total production, followed by Jharkhand 20%; Odisha, 19.9%; Madhya Pradesh, 13.4%; Andhra Pradesh, 8.9%; Maharashtra, 6.6%; West Bengal, 5%; Uttar Pradesh, 2.6%; and Arunachal Pradesh, Assam, Jammu and Kashmir, and Meghalaya, 1.1% each. In 2014, 536 coal mines were in production in India, of which 152 were located in the State of Jharkhand; 100, in West Bengal; 71, in Madhya Pradesh; 63, in Maharashtra; 61, in Chhattisgarh; 49, in Andhra Pradesh; 27, in Odisha; and the remaining 13 mines were located in Arunachal Pradesh, Assam, Jammu and Kashmir, Meghalay, and Uttar Pradesh (Das, 2014; Eastern Coalfields Ltd., 2014, p. 4; Indian Bureau of Mines, 2014d, p. 2, 14–15, 31).

In 2014, coal production was reported out by eight state-owned companies— Bharat Coking Coal Ltd. (BCCL), Central Coalfields Ltd. (CCL), Eastern Coalfields Ltd. (ECL), Mahanadi Coalfields Ltd. (MCL), Northern Coalfields Ltd. (NCL), North-Eastern Coalfields Ltd. (NEC), South-Eastern Coalfields Ltd. (SECL), and Western Coalfields Ltd. (WCL), all of which were subsidiaries of Coal India Limited (CIL), as well as Singareni Collieries Co. Ltd. (SCCL) (a joint venture between the Government of India, and the State government of Adhra Pradesh), and the Neyveli Lignite Corp. (NLC), which produced lignite. In 2013, CIL approved two open pit mines for Southeast Coal Chhal-OC, which had a production capacity of 6.0 Mt/yr. The company planned to increase capacity at the Kusmunda-OC project to 50 Mt/yr from 15 Mt/yr. CIL operated four mines—the Ledo, the Tikak, the Tipong, and the Tirap Mines—at the Makum Coalfileds of Assam in the northeastern region. The Ledo, the Tikak, and the Tirap Mines were opencast projects, and the Tipong Mine was an underground mine (Hindu, The, 2014c).

In 2014, the Supreme Court of India canceled 218 of 222 coal blocks that were allocated since 1993. The cancellation was followed with a penalty of $4.79 per ton of coal extracted since 1993. Four blocks were exempted from the penalty, including the Moher and the Moher Amroli Extension, which was operated by Sasan Power Ltd.; Tasra, which was operated by SAIL; and Pakri Barwadih, which was operated by National Thermal Power Corp. (Indian Bureau of Mines, 2013b, p. 23; Global Cement, 2014i; Hindu, The, 2014c; Ministry of Coal, 2014, p. 4–5).

Natural Gas and Petroleum.—In 2014, India remained the fourth largest consumer of oil and petroleum in the world after China, the United States, and Russia, and it was the world's fourth-ranked importer of crude oil and petroleum products. The demand for hydrocarbons and renewables was increasing in India owing to development and growth and a shift from coal to hydrocarbons and renewable sources of energy for homes and transportation (Oilprice.com, 2013; Thomson Reuters, 2013; Bhandari, 2014; Brics Post, The, 2014; Mashru, 2014; U.S. Energy Information Administration, 2014, p. 10; Gupta, 2015; Ministry of Petroleum and Natural Gas, 2015, p. 5).

State-owned companies Oil Natural Gas Corp. Ltd., (ONGC) and Oil India Ltd. (OIL) accounted for 68% of oil production and 73% of natural gas production. ONGC accounted for 59% of crude oil and 66% of natural gas production; OIL, 9% of crude oil and 7% of natural gas; and private joint-venture companies, 32% of oil and 26% of natural gas. Offshore crude oil production accounted for 48% of total production, and the remaining 52% of crude oil was produced by six States—Rajasthan (24.3%), Gujarat (13.4%), Assam (12.4%), and Andhra Pradesh, Arunachal Pradesh, and Tamil Nadu (1.7% combined). The offshore natural gas production accounted for 75% of total natural gas production, and the remaining natural gas was produced in eight States—Assam (8.1%), Gujarat (4.7%), Tamil Nadu (3.7%), Andhra Pradesh (3.3%), Rajasthan (2.8%), Tripura (2.3%), and Arunachal Pradesh and West Bengal (0.6% combined) (Indian Bureau of Mines, 2014n, p. 5; Ministry of Petroleum and Natural Gas, 2015, p. 18, 23–24).

Uranium.—In 2014, Uranium Corp. of India Ltd. operated seven mines in the State of Jharkhand at Bagjata, Bandduhurand, Bhatin, Jaduguda, Mahuldih, Narwapahar, and Turamdih. In 2013, Jaduguda had a production capacity of 300,000 t/yr of uranium. The Jadugora Mine was the deepest underground mine in the country. The Bhatin Mine was undergoing improvements of layout and ore hosting arrangements. The applications for lease renewal for the Jaduguda and the Bahtine Mines were waiting for approval. The most modern underground uranium mine was the Narwapahar Mine, which had a production capacity of 350,000 t/yr. The company planned to increase Narwapahar Mine, which had a production capacity to 525,000 t/yr. Turamdih, which was a modernized underground mine, had a production capacity of 263,000 t/yr in 2013. The company planned to increase its capacity to 350,000 t/yr. The Banduhurang open pit mine had a production capacity of 1.2 Mt/yr of ore and faced many social, political, and environmental problems, which caused frequent disruptions. The ore produced at the Bagjata Mine was used by the Jaduguda processing plant; however, political issues were affecting the transportation of ore to the plant. The Mahuldih Mine was commissioned in March 2013, and the ore produced at the mine was used by the Turamdih processing plant.

In 2014, the mining license for the Jaduguda Mine (which is located in the State of Jharkhand) expired, and the Government of Jharkhand stopped operations. The company planned to increase production from other mines; however, owing to the low quality of the ore, the production costs increased. In 2014, India planned to import uranium ore from Australia, Kazakhstan, and Russia (Uranium Corp. of India Ltd., 2014, p. 9–11).

New uranium deposits were discovered near Jharkhand's East Singhbhum District between the Jaduguda and the Narwapahar Mines in 2013. The new discovery was expected to expand the life of the country's first uranium mine in Jaduguda by 5 to 6 years and to allow India to make major changes in its nuclear program (Seth, 2013; Economic Times, The, 2014c).

Reserves and Resources

Data for reserves and resources are in table 5.

Outlook

The mineral industry of India faces many challenges, including Government delays in clearance processing and land acquisition, inadequate infrastructure, insufficient funding, and limited domestic energy resources to support economic growth and to meet the residential and transportation needs. The new Government intensified its efforts to increase the country's mineral production by adopting new mineral and trade policies to attract foreign investment, and to overcome the challenges that the mining industry faced. The Government implemented a "Make in India" strategic plan that sought to transform India into a global design and manufacturing hub. The Government is also amending its land acquisition and labor laws. Given its efforts, India is likely to continue to be self-sufficient in some of the minerals and metals that constitute the primary raw materials for its various industries. In the next few years, production of steel is expected to continue to increase. Aluminum and alumina companies and cement plants are expected to continue to expand their production capacities. Newly discovered uranium deposits are likely to improve the domestic nuclear fuel supply. India's economic development would be affected by how the country overcomes challenges faced by the mineral industry, and by the speed of the implementation of some reforms and policies (Chaturvedi and Mukherji, 2013; McKinsey & Co., 2014, p. 5, 12–14; Ministry of Steel, 2014, p. 4; U.S. Energy Information Administration, 2014, p. 1; World Bank Group, The, 2014, p. 3; Ministry of Petroleum and Natural Gas, 2015, p. 5).

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TABLE 1
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2010	2011	2012	2013	2014
METALS						
Aluminum:[4]						
Alumina, Al_2O_3 equivalent	thousand metric tons	3,540 [r]	3,842 [r]	3,690 [r]	3,739	3,800
Bauxite, gross weight	do.	12,851 [r]	13,000 [r]	15,300 [r]	20,420 [r]	21,000
Metal, primary	do.	1,586 [r]	1,645 [r]	1,704 [r]	1,700 [r]	2,100
Cadmium, metal		550	455 [r]	391 [r]	418 [r]	385
Chromium, chromite, gross weight	thousand metric tons	3,426 [r]	4,326 [r]	2,923 [r]	2,950	3,540
Cobalt, metal[4]		1,187	1,299	800	295	100
Copper:[4]						
Mine output, Cu content		35,500	37,700	34,000	36,100	36,000
Metal, primary:						
Smelter		748,800	670,000	680,000	617,000	765,000
Refinery:						
Electrolytic, cathode		654,900	671,100	670,000	680,000	644,000
Fire refined		9,000	9,200 [r]	9,210 [r]	9,300 [r]	8,900
Total		663,900	680,300	679,210	689,300	652,900
Ferroalloys:						
Ferroaluminum		7,000	7,000	7,100	5,400	5,500
Ferroboron		95	98	95	26	21
Ferrochromium, including charge chrome		850,000	890,000 [r]	800,000 [r]	902,000 [r]	916,000
Ferrochromiumsilicon		10,000	10,000 [r]	9,000 [r]	11,000	11,000
Ferromanganese[4]		440,000	440,000	402,000	447,000	666,000
Ferromolybdenum		3,000	3,200	3,100	1,200	1,200
Ferronickel magnesium		227	253	270	473	473
Ferrosiliconmagnesium		17,000	18,000	18,000	21,000	22,000
Ferrosilicon		115,000	127,000	89,000 [r]	90,000 [r]	90,000
Ferrosiliconzirconium		150	170	180	--	--
Ferrotitanium		2,200	2,300	2,400	800	800
Ferrotungsten		150	225	--	--	--
Ferrovanadium		1,800	1,850	1,900	879	906
Silicomanganese[4]	thousand metric tons	1,200 [r]	1,400	1,500	1,600 [r]	1,700
Total		1,447,822	1,501,496 [r]	1,334,545	1,481,378	1,715,600
Gold, smelter output	kilograms	2,320	2,245	2,194 [r]	1,588 [r]	1,560
Iron:[4]						
Pig iron	thousand metric tons	39,560 [r]	43,624 [r]	47,987 [r]	51,359 [5]	55,166
Direct-reduced	do.	23,420 [r]	21,970 [r]	20,050 [r]	16,893 [r]	20,366
Iron and steel:						
Iron ore and concentrate:						
Gross weight	do.	212,383 [r]	187,749 [r]	152,600 [r]	136,100 [r, 5]	129,800 [5]
Fe content (62%)	do.	131,677 [r]	116,404 [r]	94,612 [r]	84,382 [r]	80,476
Steel:						
Crude[4]	do.	68,976 [r]	73,471 [r]	77,264 [r]	81,299 [r]	87,292
Semimanufactures[6]	do.	51,000	53,000	52,000	53,000	59,400
Lead:						
Mine output, Pb content		70,000	84,000	100,000	105,000	106,000
Metal, refined:[4]						
Primary		62,000	92,000	119,000 [r]	120,000 [r]	129,000
Secondary		305,000	327,000	341,000	343,000	348,000
Total		367,000	419,000	460,000 [r]	463,000 [r]	477,000
Manganese:						
Ore and concentrate, gross weight[4]	thousand metric tons	2,858	2,542	2,470 [r]	2,320 [r]	2,570
Mn content[4]	do.	1,013	895	888 [r]	920 [r]	945
Selenium	kilograms	15,000	16,000	16,000	16,000	--

See footnotes at end of table.

TABLE 1—Continued
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2010	2011	2012	2013	2014
METALS—Continued						
Silver, smelter output[4]	kilograms	145,922	192,434	332,321	355,842	303,339
Tin, metal, smelter[4]	do.	60,236	51,735	48,023	38,082	22,719
Titanium concentrates, gross weight:						
Ilmenite		729,177 r	550,000	340,000	436,000 r	320,000
Rutile		19,097 r	18,573 r	24,000	26,000	19,100
Zinc:[4]						
Mine output, Zn content		740,000	796,000	758,000	793,000 r	706,000
Metal:						
Primary		694,000	726,000	666,000	734,000	673,000
Secondary		52,000	54,000	49,000	54,000	50,000
Total		746,000	780,000 r	715,000	788,000	723,000
Zirconium, zircon concentrate, gross weight		27,800	39,000	40,000	40,000	40,000
INDUSTRIAL MINERALS						
Abrasives, natural, n.e.s.:[7]						
Garnet	thousand metric tons	1,990 r	1,820 r	1,388 r	700	800
Jasper		8,800	8,900	8,800	8,800	--
Diaspore		26,000	24,000	18,000	15,000	15,000
Asbestos		300 r	300 r	400 r	300	200
Barite	thousand metric tons	2,293 r	1,918 r	1,749 r	1,740 r	1,600
Bromine, elemental		1,600	1,600	1,700	1,700 r	2,100
Cement, hydraulic	thousand metric tons	220,000	240,000	270,000	280,000	280,000
Chalk		179,000	178,000	170,000	136,000	126,000
Clays:[8]						
Ball	thousand metric tons	1,000	1,500	1,800	1,900	1,900
Bentonite		561,000	739,000	996,000	1,100,000	1,100,000
Fire	thousand metric tons	780	950	860 r	740	710
Kaolin:						
Salable crude	do.	2,700	2,900	3,400	4,400	4,700
Processed	do.	78	76	101	78	67
Total	do.	2,778 r	2,976 r	3,501 r	4,478 r	4,767
Diamond:[5]						
Gem	thousand carats	13	16	28	36	37
Industrial	do.	37	36	35	37	38
Total	do.	50	52	63	73	75
Dunite		35,700 r	35,010 r	74,565 r	70,447 r	70,447
Feldspar		506,000 r	763,000	1,180,000 r	1,500,000 r	1,400,000
Felsite[5]		2,015 r	1,255 r	1,176 r	711 r	549
Fluorspar:[5]						
Concentrates, metallurgical grade		4,600 r	8,000 r	5,010 r	3,107 r	5,000
Other fluorspar materials, acid grade		8,400 r	-- r	-- r	-- r	--
Gemstones, excluding diamond:						
Agate		17 r	362 r	489 r	198 r	100
Agate, including chalcedony pebble		150	150	140	140	140
Graphite[9]		117,929 r	143,929 r	137,452 r	142,546 r	170,000
Gypsum[5]	thousand metric tons	4,531 r	5,214 r	3,648 r	3,540 r	3,500
Selenite		8,702 r	11,469 r	8,945 r	2,293 r	532
Kyanite and related materials:						
Kyanite		5,866 r	4,537 r	1,816 r	1,708 r	1,922 [5]
Sillimanite		45,010 r	56,601 r	47,604 r	57,132 r	61,597 [5]
Lime		14,000 r	15,000 r	15,000 r	16,000	16,000

See footnotes at end of table.

TABLE 1—Continued
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2010	2011	2012	2013	2014
INDUSTRIAL MINERALS—Continued						
Magnesite		301,000	236,000	224,000	213,000	200,000
Mica:[5]						
Crude		1,265 r	1,758 r	1,416 r	1,512 r	1,610
Scrap and waste		7,508 r	12,467 r	14,186 r	16,826 r	17,545
Total		8,773 r	14,225 r	15,602 r	18,338 r	19,155
Nitrogen, N content of ammonia	thousand metric tons	10,600	10,500 r	10,650 r	10,840 r	10,780
Phosphate rock, including apatite[5]	do.	6,357	5,471 r	3,350 r	2,157	2,796
Pigments, mineral, natural, ocher	do.	1,229 r	1,200	1,400	1,500	1,400
Pyrite, gross weight		115,000	110,000	110,000	110,000	110,000
Pyroxenite[5]		259,737 r	127,824 r	62,201 r	15,803 r	2,985
Rare-earths, monazite concentrate, gross weight[10]		5,200	5,200	5,400	2,900	NA
Salt:						
Rock	thousand metric tons	1	2	2	2	--
Other	do.	17,000	16,000	17,000	18,000	17,000
Total	do.	18,000	18,000	19,000	20,000	17,000
Sand:[5]						
Silica	do.	3,172 r	4,496 r	3,985 r	3,432 r	3,346
Other	do.	2,083 r	2,483 r	2,628 r	2,572 r	3,000
Slate[5]		-- r	-- r	-- r	278 r	239
Soda ash	thousand metric tons	1,500 r	1,400	1,500	1,500	1,500
Stone, sand and gravel:[5]						
Calcite		41,447 r	50,267 r	67,577 r	87,129 r	92,146
Dolomite	thousand metric tons	5,858 r	5,937 r	6,527 r	7,010 r	7,108
Limestone	do.	242,990 r	258,510 r	275,444 r	278,978 r	279,000
Quartz and quartzite	do.	501 r	712 r	977 r	1,307 r	1,925
Sulfur:						
Byproduct from metallurgy	do.	1,143 r	1,000	1,209 r	1,200	1,200
Byproduct from petroleum	do.	1,600	1,600	1,600	1,600	1,500
Talc and related materials:						
Pyrophyllite[5]		240,248 r	251,939 r	248,022 r	217,690 r	207,454
Steatite, soapstone		897,000 r	974,000	954,000	940,000	865,126 [5]
Vermiculite		17,341 r	12,454 r	8,315 r	9,554 r	10,176
Wollastonite[5]		170,932 r	184,179 r	152,274 r	145,000 r	192,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:[5]						
Bituminous	thousand metric tons	480,000	500,000	550,000	563,000	540,000
Lignite	do.	27,000	28,000	30,000	26,000 r	27,000
Total	do.	507,000	528,000	580,000	589,000	567,000
Gas, natural:						
Gross	million cubic meters	50,800 r	46,100 r	40,300 r	33,700 r	31,700
Marketable	do.	32,000	33,000	35,000	34,400	33,000
Petroleum:						
Crude	thousand 42-gallon barrels	318,000 r	330,000 r	326,000 r	326,000 r	322,000
Refinery products:						
Liquefied petroleum gas	do.	94,000 r	86,000 r	85,000 r	89,000 r	92,000
Gasoline	do.	190,000 r	222,000 r	231,000 r	250,000 r	200,000
Kerosene and jet fuel	do.	140,000 r	136,000 r	140,000 r	141,000 r	146,000
Distillate fuel oil	do.	677,000 r	717,000 r	750,000 r	812,000 r	830,000
Residual fuel oil	do.	228,000 r	261,000 r	234,000 r	191,000 r	175,000
Other	do.	310,000	300,000	280,000	275,000	300,000
Total	do.	1,639,000	1,722,000	1,720,000	1,758,000	1,743,000

See footnotes at end of table.

TABLE 1—Continued

INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]	2010	2011	2012	2013	2014
MINERAL FUELS AND RELATED MATERIALS—Continued					
Uranium, U_3O_8[4]	400	400	385	400	385
U content[4]	336	336	323	336	323

[r] Revised. do. Ditto. NA Not available. -- Zero.

[1] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes data available through December 17, 2015.

[3] In addition to the commodities listed, boron, corundum, fuller's earth, and other gemstones (aquamarine, emerald, ruby, and spinel) were produced, but output was not reported and available information was inadequate to make reliable estimates of output.

[4] Reported figure.

[5] The quantity reported is for the fiscal year, which runs from April of the preceding year to March of that stated.

[6] Excludes production from small steel plants.

[7] Not elswhere specified.

[8] Updated data for clays are based on data from the India Bureau of Mines.

[9] Marketable production is 10% to 20% of mine production.

[10] Significant quantities are contained in stockpiled monazite tailings, but quantitative data are not available.

TABLE 2
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Alumina	National Aluminium Co. Ltd. (NALCO) (Government, 80.93%)	Dhamanjodi refinery, Odisha[1]	2,100
Do.	Bharat Aluminium Co. Ltd. (Government, 49%, and Vedanta Aluminum Ltd., 51%)	Korba refinery, Chhattisgarh	200
Do.	Utkal Alumina International Ltd. (Hindalco Industries Ltd., 100%)	Koraput refinery, Odisha[1]	1,500
Do.	Madras Aluminium Co. Ltd. (MALCO) (Vedanta Group, 80%, and others, 20%)	Mettur refinery, Tamil Nadu	85
Do.	Hindalco Industries Ltd. (Aditya Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Renukoot refinery, Uttar Pradesh	700
Do.	do.	Belgaum, Karnataka	350
Do.	do.	Muri, Jharkhand	450
Do.	Vedanta Aluminium Ltd. (Vedanta Resources plc, 100%)	Lanjigarh, Odisha	1,000
Aluminum	do.	Jharsuguda, Odisha[1]	500
Do.	National Aluminium Co. Ltd. (NALCO) (Government, 100%)	Angul smelter, Odisha[1]	567
Do.	Hindalco Industries Ltd. (Aditya Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Hirakud smelter, Odisha[1]	217
Do.	do.	Renukoot, Uttar Pradesh	345
Do.[2]	do.	Alupuram, Kerala	NA
Do.[3]	Bharat Aluminium Co. Ltd. (Government, 49%, and Vedanta Aluminum Ltd., 51%)	Korba smelter, Korba-III smelter, Chhattisgarh	670
Do.[4]	Madras Aluminium Co. Ltd. [Sterlite Industries (India) Ltd., 80%, and others, 20%]	Mettur smelter, Tamil Nadu	40
Do.	Hindalco Industries Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Renukoot smelter, Uttar Pradesh	345
Barite	Andhra Pradesh Mineral Development Corp. Ltd. (Andhra Pradesh State government, 100%)	Cuddapah District mines, Andhra Pradesh	1,600
Do.	ICL Ltd.	do.	300
Do.	Associated Mineral Corp.	do.	75
Do.	Pragathi Minerals	do.	50
Do.	Vijayalaxmi Minerals Trading Co.	do.	50
Bauxite	Bharat Aluminium Co. Ltd. [Government, 49%, and Sterlite Industries (India) Ltd., 51%]	Amarkantak Mine, Madhya Pradesh	200
Do.	Dr. Nirmalaben Mehta	Gujarat	NA
Do.	Indian Aluminium Co. Ltd. (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	Kolhapur District mines, Maharashtra	600
Do.	Gujarat Mineral Development Corp. Ltd. (Gujarat State government, 75%, and public and institutional investors, 25%)	Gadhsisa Mine and Ratadia project, Kutch District, Bhatia project, Jamnagar Distirct	500
Do.	Hindalco Aluminium Co. Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Mines in Lohardaga District, Jharkhand	750
Do.	Indian Aluminium Co. Ltd. (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	do.	200
Do.	National Aluminium Co. Ltd. (Government, 100%)	Mines in Panchpatmali Hills, Damanjodi Koraput District, Odisha[1]	6,300
Do.	Minerals & Minerals Ltd. (Government, 100%)	Mines in Richuguta, Palamau District, Jharkhand	200
Do.	Ashapura Minechem Ltd	Rajasthan, Gujarat, Maharashtra, Karnataka Kerala, Andhra Pradesh and Odisha[1]	NA
Do.	M.P. State Mining Corp. Ltd.	Chachandeeh Mine, Anuppur District	NA
Do.	Bharatesh Construction Co.	Maharashtra, Kolhapur	NA
Do.	Alatage Stone Crushing Ind.	Maharashtra, Raigarh	NA
Do.	Ram Awatar Agrawal	Madhya, Pradesh	NA
Do.	Panditrao Mines & Minerals Pvt. Ltd.	Maharashtra, Kolhapur	NA
Do.	Prabhudas Vithaldas	Gujarat	NA

See footnotes at end of table.

TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Bauxite—Continued	Pravin Kumar Ghosalia	Goa	NA
Do.	Pushpaben Prabhudas Mkhecha	Gujarat	NA
Do.	Bombay Minerals Ltd.	Asota Mewasa, Gujarat	NA
Do.	Utkal Alumina International Ltd.	Rayagada District	8,500
Bentonite	Ashapura Minechem Ltd (Ashpura Group)	Kutch, Gujarat	350
Do.	Ashpura Volclay Ltd. (Ashpura Minechem Ltd. and AMCOL Int. Corp)	Bhuji and Dharur	72
Do.	Ashpura International Ltd.	NA	NA
Do.	Vijaylaxmi Group of Industries	West Rajasthan	NA
Do.	Gimpex Ltd.	Chennai	NA
Boron	Borax Morarji Ltd.	Ambernath, Maharashtra	17
Cement	Ultratech Cement Ltd.	12 integrated plants and 12 grinding units	58,800
Do.	Century Cement [Century Textiles and Industries Ltd. (a subsidiary of the Birla Group, 100%)]	Baikunth plant, Madhya Pradesh	1,120
Do.	Ambuja Cements Ltd. (Holcim Group, 14.8%)	Plants in 7 States	25,000
Do.	Coromandel Fertilizers Ltd. [Chevron Chemical Co., 23.55%; International Minerals and Chemical Co., 20.89%; Parry and Co., 10.64%; E.I.D. Parry (India) Ltd., 6.65%; others, 38.27%]	Chilamkur plant, Andhra Pradesh	1,000
Do.	Dalmia Cement (Bharat) Ltd.	Dalmiapuram and Ariyalur, Tamil Nadu; and Kadapa, Andhra Pradesh	21,000
Do.	Birla Corp. Ltd. (M.P. Birla Group)	Birla Vikas & Satna, Birla Cement & Chanderia, Durgapur, Rae Bareli, Durga Hitech	5,780
Do.	ACC Ltd. (Holcim Group, 67%)	Gagal I & II, Wadi I & II , Jamul, Lakheri Thondebhavi, Kudithini, Kymore, Chanda, Chaibasa and Sindri, Damodhar, Bargarh, Madhukkarai, Tikaria, Vizag	28,800
Do.	Raymond Cement Works (a division of Raymond Woolen Mills Ltd., JK Singhania, principal shareholder)	Gopalnagar plant, West Bengal	1,250
Do.	Shree Cement Ltd.	Haridwar plant, Uttarakhand	1,800
Do.	OCL India Ltd.	Kapilas and Rajgangpur, Odisha[1]	5,500
Do.	Rajashree Cement (a division of Indian Rayon and Industries Ltd., 100%)	Khor plant, Karnataka	1,020
Do.	My Home Industries Ltd. (joint venture of My Home Group and CRH plc)	Mellacheruvu and Visakhapatnam in Andhra Pradesh	4,600
Do.	HeidelbergCement India Ltd.	Narasingarh plant, Haryana	1,090
Do.	CCI Ltd. (Government, 100%)	Adilabad, Akaltara, Bokajan, Charkhi-Dadri, Kurkunta, Mandhar, Neemuch, Rajban, Tandur, Delhi	3,850
Do.	Andhra Cements Ltd. (Jaypee Group 100%)	Vizag, Nadikude-Durga Cement	1,420
Do.	J. K. Cement Works (a division of JK Synthetics Ltd.), 100%	Nimbahera plant, Mangrol, Muddapur Jhari, Gotan, Lakshim Cement, Lakshmi Cement-Kalol	11,000
Do.	India Cements Co. Ltd. (Government, 26%; Life Insurance Corp. of India, 24%; others, 50%)	Sankarnagar plant and 2 plants, Tamil Nadu; 4 plants, Andhra Pradesh; Mahi plant, Rajasthan	15,800
Do.	Prism Cement Ltd.	Satna plant, Madhya Pradesh	3,000
Do.	Jaiprakash Associates Ltd.	Sewagram, Gujarat	2,400
Do.	Shree Digvijay Cement Co. Ltd.	Shreeniwas plant, Maharashtra	1,070
Do.	JK Lakshmi Cement Ltd. (a division of Straw Products Ltd., JK Singhania, principal shareholder)	Sirohi plant, Rajasthan and Ahmadabad, Gujarat	4,700
Do.	Lafarge S.A.	Arasmeta and Sonadih, Chhattisgarh; Jojobera, Jharkhand; and Mejia West Benga	1,400
Do.	Manikgarth Cement [Century Textiles and Industries Ltd. (a subsidiary of the Birla Group, 100%)]	Tehsil Rajura plant, Maharashtra	1,000

See footnotes at end of table.

TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity^e
Cement—Continued	Vikram Cement [Grasim Industries Ltd. (a subsidiary of the Birla Group, 100%)]	Vikram plant, Madhya Pradesh	1,000
Do.	Raasi Cement Ltd. (Andhra Pradesh State government, 50%, and Development Co. Ltd., 50%)	Vishnupuram plant, Andhra Pradesh	1,000
Do.	Tamil Nadu Cements Corp. Ltd.	Alangulam, Ariyalur, Virundhunagar District	900
Do.	Madras Cements Ltd.	Ramasamyraja Nagar, Jayantipuram, Alathiyur Works 1 and II, Ariyalur Uthiramerur, Salem, Kolaghat	13
Do.	The Mehta Group	Suarashtra Cement, Gujarat Sidhee Cement	2,700
Do.	Jaypee Cement Ltd.	Jaypee Rewa, Jaypee Bela, Jaypee Sadva Khurd, Jaypee Ayodhyaa Dalla Chunar, Jaypee Panipat, Jaypee Kutch, Jaypee Wanakbori, Jaypee Roorkee, Jaypee Wanakbori, Jaypee Bagheri, Bhilai Jaypee	27
Do.	Kesoram Industries Ltd.	Kesoram Cement, Vasvadatta Cement	7,250
Do.	Mangalam Cement Ltd.	Mangalam Cement, Neer Shree Cement	3,250
Do.	Orient Papers & Industries	Orient Cement, Orient-Cement-Jalgaon	5,000
Do.	Penna Cement Ltd.	Penna Tadippatri 1 & II, Penna Ganeshpahad, Penna-Boyareddypalli Ltd., Penna-Tandur	6,500
Do.	Malabar Cements Ltd.	Malabar Cements, Malabar Cements	620
Do.	Binani Cement Ltd.	Binani Cement Sirohi, Binani Cement Sikar	6,250
Do.	Rain Cement Ltd.	Rain Comdt. Unit I, Rain Comdt. Unit LN–1, Rain Comdt. Unit LN–2	4,000
Do.	KCP Ltd.	KCP Ltd-Macherla, Maktyala	2,350
Do.	Cement Manufacturing Co. Ltd.	Cement Manufacturing Co. Ltd., Megha T&E (P) Ltd.	1,270
Do.	Chettinad Cement Corp. Ltd.	Chettinad-Karur, Chettinad Karikkali, Chettinad-Ariyalur	10,500
Do.	Sagar Cement Ltd.	BMM Cements Ltd., Andhra Pradesh	3,750
Do.	Zuari Cement Ltd.	Zuari Cement, Sri Vishnu Cement	3,400
Chromite	Mysore Minerals Ltd. (state-owned)	Aladahalli mines	37
Do.	do.	Byrapura mines	15
Do.	do.	Bhakthara Halli mines	24
Do.	do.	Jambur mines	5
Do.	do.	Tagadur mines	12
Do.	Ferro Alloys Corp. Ltd.	Randia plant, Bhadrak, Cuttack District, Odisha[1]	65
Do.	Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	300
Do.	Tata Steel Ltd.	do.	351
Do.	Ferro Alloys Corp. Ltd.	Dhenkanal and Kendujhar District, Odisha[1]	150
Do.	Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	200
Do.	Mysore Minerals Ltd.	Hassan District, Karnataka	125
Do.	Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	100
Do.	Ferro Alloys Corp. Ltd.	Khammam District, Andhra Pradesh	100
Do.	Balasore Alloys Ltd.	Sukinda Valley, Jajpur, Odisha[1]	95
Do.	Indian Metal & Ferro Alloys Corp. Ltd.	Therubali, Ryaagada and Choudwar, Cuttack Mahagiri and Nuasahi Mines	62
Do.	Misrilall Mines Pvt. Ltd.	Saruabil village, Jajpur, Odisha[1]	NA
Do.	Jindal Stainless Ltd.	Jindal Chromite Mines, Jajpur, Odisha[1]	NA
Clay:			
Ball clay	Bikaner Ceramics	Rajasthan, Bikaner	75
Do.	Sampat Lal Daga	do.	NA
Fire clay	Shanta Sales Corp.	do.	NA

See footnotes at end of table.

TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Clay—Continued:				
Kaolin		20 Microns Ltd.	Bhuj, Gujarat	65
Do.		English India Clays Ltd.	Veli, Kerala	240
Coal, bituminous	million metric tons	Bharat Coking Coal Ltd. [a subsidiary of Coal India Ltd. (Government, 100%)]	Bihar and West Bengal	26
Do.	do.	Central Coalfields Ltd. [a subsidiary of Coal India Ltd. (Government, 100%)]	Bihar	27
Do.	do.	Eastern Coalfields Ltd. [a subsidiary of Coal India Ltd. (Government, 100%)]	Bihar and West Bengal	21
Do.	do.	Mahanadi Coalfields Ltd. [a subsidiary of Coal India Ltd. (Government, 100%)]	Odisha[1]	21
Do.	do.	North Eastern Coalfields Ltd. [a subsidiary of Coal India Ltd. (Government, 100%)]	Assam	640
Do.	do.	Northern Coalfields Ltd. [a subsidiary of Coal India Ltd. (Government, 100%)]	Madhya Pradesh and Uttar Pradesh	24
Do.	do.	Singareni Collieries Co. Ltd. (Andhra Pradesh State government, 50%, and Government, 50%)	Andhra Pradesh and Maharashtra	18
Do.	do.	South Eastern Coalfields Ltd. [a subsidiary of Coal India Ltd. (Government, 100%)]	Chhattisgarh	36
Do.	do.	Western Coalfields Ltd. [a subsidiary of Coal India Ltd. (Government, 100%)]	Madhya Pradesh and Maharashtra	18
Coal, lignite	do.	Neyveli Lignite Corp. Ltd. (NLC) (Government, 100%)	Tamil Nadu	17
Copper, mine		Hindustan Copper Ltd. (HCL) (Government, 100%)	Indian Copper Complex Mines, Ghatsila District, Jharkhand	450
Do.		do.	Khetri Copper Complex Mines, Khetrinagar Rajasthan	1,400
Do.		do.	Malanjkhand Copper Complex Mines, Balaghat District, Madhya Pradesh	2,000
Copper, metal		Hindalco Industries Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Birla Copper Complex smelter, Dahej, Gujarat	500
Do.		Hindustan Copper Ltd. (HCL) (Government, 100%)	Indian Copper Complex smelter-refinery, Ghatsila District, Jharkhand	21
Do.		do.	Khetri Copper Complex smelter-refinery, Khetrinagar District, Rajasthan	3,000
Do.		do.	Taloja copper project, Maharashtra	NA
Do.		Vedanta Aluminum Ltd.	Tuticorin smelter, Tamil Nadu	400
Do.		do.	Silvassa refinery, Gujarat	300
Do.		Jhagadia Copper Ltd.	Jhagadia, Gujarat	50
Diamond	carats	National Mineral Development Corp. Ltd. (NMDC) (Government, 100%)	Mahjgawan Mine	25,000
Fluorite		Maharashtra State Mining Corporation Ltd.	Dongargaon, Maharashtra, Chandrapur	12
Do.		Gujarat Mineral Development Corporation Ltd.	Gujarat, Vadodara	185
Do.		Rajasthan State Mines and Minerals Ltd.	Rajasthan, Jalore	NA
Gold	kilograms	Hutti Gold Mines Co.	Hutti Mine, Karnataka	490
Do.	do.	do.	Uti Mine, Karnataka	55
Do.	do.	do.	Hira-Buddini	157
Do.	do.	Mahmohan Minera Industries (Pvt) Ltd.	Kunderkocha Mine, Jharkahand	NA
Graphite		Agrawal Graphite Industries Ltd.	Belpara District, Odisha[1]	10
Do.		Tamil Nadu Minerals Ltd.	Sivaganga District, Tamil Nadu	NA
Gypsum		FCI Aravali Gypsum and Minerals India Ltd.	Kavas-Utarali group of mines, Mohangarh group of mines, Bikaner group of mines Suratgarh group of mines, Raimsinghpur group of mines, Kishanpura A and B Rajasthan	526
Iron and steel, crude steel		Visvesvaraya Iron and Steel Ltd. (Karnataka State government, 60%, and Government-owned Steel Authority of India Ltd., 40%)	Bhadravati steel plant, Karnataka	180
Do.		Steel Authority of India Ltd. (Government, 100%)	Bhilai steel plant, Jharkhand	4,930
Do.		do.	Bokaro steel plant, Jharkhand	4,600

See footnotes at end of table.

TABLE 2—Continued

INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Iron and steel, crude steel —Continued	Indian Iron and Steel Co. Ltd. (a wholly owned subsidiary of Government-owned Steel Authority of India Ltd.), 100%	Burnpur steel plant, West Bengal	1,500
Do.	Ispat Industries Ltd.	Dolvi, Maharashtra	3,000
Do.	Steel Authority of India Ltd. (Government, 100%)	Durgapur steel plant, West Bengal	1,600
Do.	Tata Steel Ltd.	Jamshedpur steel plant, Jharkhand	6,800
Do.	do.	Jagdalpur, Chattisgarh	2,000
Do.	do.	Duburi, Odisha[1]	3,000
Do.	Steel Authority of India Ltd. (Government, 100%)	Rourkela steel plant, Odisha[1]	1,800
Do.	Rashtriya Ispat Nigam Ltd.	Visakhapatnam steel plant, Andhra Pradesh	3,000
Do.	JSW Steel Co. Ltd.	Vijayanagar, Karnataka	7,800
Do.	Ministeel plants (privately owned)	18 plants located throughout India	4,700
Do.	Essar Steel Co. Ltd.	Hazira, Gujarat	3,000
Do.	Lloyds Steel Industries Ltd.	Wardha, Maharashtra	500
Do.	MSP Steel and Power Ltd.	Raipur, Chhattisgarh	750
Iron ore	National Mineral Development Corp. Ltd. (NMDC) (Government, 100%)	Bailadila, Chhattisgarh	9,000
Do.	Steel Authority of India Ltd. (Government, 100%)	Bastar and Durg District, Chhattisgarh; Bolani, Odisha;[1] and Chiria, Jharkhand	7,000
Do.	Kudremukh Iron Ore Co. Ltd. (Government, 100%)	Kudremukh, Chikmagalur District, Karnataka	10,300
Do.	National Mineral Development Corp. Ltd. (NMDC) (Government, 100%)	Donimalai, Karnataka	9,000
Do.	Chowgule and Co. Ltd.	Goa	2,500
Do.	Dempo Mining Corp. Ltd.	do.	2,500
Do.	V.M. Salgaocar & Bros. Pvt. Ltd.	do.	2,500
Do.	Sesa Goa Ltd. (Vedanta Resources plc, 51%)	Codli and Sonshi, Goa	NA
Do.	Steel Authority of India Ltd. (Government, 100%)	Kendujhar District, Odisha[1]	3,000
Do.	Tata Steel Ltd.	do.	2,000
Do.	NSL Consolidated Ltd. (China Metallurgical Group Corp., 10%)	Mangal, Andhra Pradesh	200
Do.	Indian Iron and Steel Co. Ltd. (a wholly owned subsidiary of Government-owned Steel Authority of India Ltd.), 100%	Singhbhum District, Bihar	2,500
Do.	Steel Authority of India Ltd. (Government, 100%)	do.	3,500
Do.	Tata Steel Ltd.	do.	3,500
Kyanite	Associated Mining Co.	Bhandara District, Maharashtra	10
Do.	Maharashtra Mineral Corp. Ltd.	do.	10
Do.	Bihar State Mineral Development Corp. Ltd. (Bihar State government, 100%)	Singhbhum District, Bihar	10
Do.	Hindustan Copper Ltd. (HCL) (Government, 100%)	do.	22
Lead:			
Primary	Hindustan Zinc Ltd. (Sterlite Opportunities and Ventures Ltd., 64.9%, and Government, 29.5%)	Chanderiya smelters, Rajasthan	105
Do.	do.	Tundoo smelter, Bihar	8
Do.	do.	Dariba smelter	100
Secondary	Indian Lead Co.	Thane refinery, Mumbai, Maharashtra	12
Do.	do.	Refinery at Kolkata	12
Ore	Hindustan Zinc Ltd. (Sterlite Opportunities and Ventures Ltd., 64.9%, and Government, 29.5%)	Agnigundala Mine, Andhra Pradesh	72
Do.	do.	Sargipalli Mine, Odisha[1]	150
Lead-zinc ore	do.	Rampura-Agucha Mine, Rajasthan	6,500
Do.	do.	Zawar Mine group, Rajasthan	1,200
Do.	do.	Kayad Mine, Rajasthan	350
Magnesite	Steel Authority of India Ltd. (Government, 100%)	Salem, Tamil Nadu	150
Do.	Dalmia Magnesite Corp.	do.	72
Do.	Tamil Nadu Magnesite Ltd. (Tamil Nadu State government, 100%)	do.	150

See footnotes at end of table.

TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity^e
Manganese ore[5]	MOIL Ltd. (Government, 100%)	Ukwa Mine, Madhya Pradesh	55
Do.	do.	Balaghat, Madhya Pradesh	310
Do.	do.	Chikla Mine, Maharashtra	150
Do.	do.	Munsar Mine, Maharshtra	55
Do.	do.	Gumgaon, Maharshtra	60
Do.	Falechand Marsingdas	Andhra Pradesh	NA
Do.	J.A. Trivedi Bros.	do.	NA
Do.	Sandur Manganese and Iron Ores Ltd.	Bellary, Karnataka	NA
Do.	Eastern Mining Co.	North Kanara, Karnataka	NA
Do.	Mysore Minerals Ltd.	do.	NA
Do.	Mangilall, Rungta (Pvt.) Ltd.	Keonjhar, Odisha[1]	NA
Do.	Orissa Mining Corp. Ltd.	do.	NA
Do.	Rungta Mines (Pvt.) Ltd.	do.	NA
Do.	Tata Steel Ltd.	Ferro Manganese plant, Odisha[1]	NA
Do.	S. Lall & Co.	do.	NA
Do.	Tata Steel Ltd.	Keonjhar, Odisha[1]	NA
Do.	Orissa Mineral Development Co. Ltd.	Koraput, Odisha[1]	NA
Do.	Orissa Mining Corp. Ltd.	do.	NA
Do.	Mysore Minerals Ltd.	Shimoga, Karnataka	NA
Do.	Aryan Mining & Trading Corp.	Sundargarh, Odisha[1]	NA
Do.	Orissa Manganese & Minerals (Pvt.) Ltd.	Surodargarh, Odisha[1]	NA
Do.	Tata Steel	do.	NA
Do.	R.B.S. Shreeram Durga Prasad and Falechand Marsingdas	Vizianagaram, Andhra Pradesh	NA
Do.	Radhika Metals & Minerals Pvt. Ltd.	NA	NA
Mica	Micafab India Pvt. Ltd.	Sydapuram Mandal, Andhra Pradesh	4,500
Do.	Premier Mica Co.	Rjupalem, Andhra Pradesh	200
Do.	Dwarakananad Reddy, and 4 others, 1-C, Vaibhav Enclave	Nellore, Andhra Pradesh	NA
Petroleum, refined thousand 42-gallon barrels per day	Cochin Refineries Ltd. (Oil and Natural Gas Corp., 55%, and private interests, 45%)	Ambalamugal refinery, Kerala	93
Do. do.	do.	Haldia refinery, West Bengal	61
Do. do.	Reliance Industries Ltd.	Jamnagar refinery, Gujarat	540
Do. do.	do.	Koyali refinery, Gujarat	185
Do. do.	Madras Refineries Ltd. (Oil and Natural Gas Corp., 52%, and private interests, 48%)	Madras refinery, Tamil Nadu	131
Do. do.	Bharat Petroleum Corp. Ltd. (Oil and Natural Gas Corp., 67%, and private interests, 33%)	Mahul refinery, Mumbai, Maharashtra	135
Do. do.	Hindustan Petroleum Corp. Ltd. (Oil and Natural Gas Corp., 51%, and private interests, 49%)	do.	110
Do. do.	Essar Oil Ltd.	Vadinar refinery, Gujarat	375
Do. do.	do.	Visakhapatnam refinery, Andhra Pradesh	90
Do. do.	Indian Oil Corp. (Oil and Natural Gas Corp., 91%, and private interests, 9%)	Mathura refinery, Uttar Pradesh	156
Do. do.	do.	Panipat refinery, Haryana	240
Phosphate rock	Rajasthan State Mineral Development Corp. Ltd. (Rajasthan State government, 100%)	Jamarkotra,Badgaon, Dakankotra, Kanpur, Kharbaria-ka-Guda, and Sallopat Mines, Rajasthan	20
Do.	Pyrites Phosphates and Chemicals Ltd.	Durmala and Maldeota underground mines, Uttar Pradesh	NA
Do.	Madhya Pradesh State Mining Corp. Ltd. (Madhya Pradesh State government, 100%)	Hirapur (Maddeora) and Khatamba Mines, Madhya Pradesh	NA
Do.	do.	Hirapur Mine (Tigoda), Madhya Pradesh	NA
Do.	do.	Jhabua Mine, Madhya Pradesh	NA
Do.	Hindustan Zinc Ltd. (HZL) (Sterlite Opportunities and Ventures Ltd., 64.9%, and Government, 29.5%)	Maton Mine, Rajasthan	NA

See footnotes at end of table.

TABLE 2—Continued

INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Silver thousand kilograms	Hindustan Zinc Ltd. (HZL) (Sterlite Opportunities and Ventures Ltd., 64.9%, and Government, 29.5%)	Chanderia, Chittorgarh, Rajasthan	518
Titanium, ilmenite-rutile ore	Kerala Minerals and Metals Ltd. (Kerala State government, 100%)	Chavara, Kerala:	
Do.	do.	Ilmenite	52
Do.	do.	Rutile	34
Do.	do.	Zircon	65
Do.	do.	Sillimanite	4
Do.	Indian Rare Earths Ltd. (IREL) (Government, 100%)	Chavara, Kerala:	
Do.	do.	Ilmenite	154
Do.	do.	Rutile	10
Do.	do.	Zircon	12
Do.	do.	Sillimanite	10
Do.	do.	Orissa Sands Complex, Ganjam, Odisha:[1]	
Do.	do.	Ilmenite	220
Do.	do.	Rutile	10
Do.	do.	Zircon	5
Do.	do.	Sillimanite	10
Do.	do.	Garnet	24
Do.	do.	Manavalakurichi, Tamil Nadu:	
Do.	do.	Ilmenite	90
Do.	do.	Rutile	4
Do.	do.	Zircon	10
Do.	do.	Monazite	6
Do.	do.	Garnet	9
Do.	Trimex Sands Pvt. Ltd. (Trimex Group)	Sirkurman deposit, Srikakulam	NA
Do.	do.	Andhra Pradesh:	
Do.	do.	Ilmenite	200
Do.	do.	Rutile	6
Do.	do.	Zircon	6
Do.	do.	Garnet	60
Do.	do.	Sillimanite	50
Do.	V.V. Mineral Ltd.	Thoothukudi, Tamil Nadu:	
Do.	do.	Ilmenite	450
Do.	do.	Rutile	12
Do.	do.	Zircon	18
Do.	do.	Zircon-sillimanite	24
Do.	do.	Garnet	150
Do.	Beach Minerals Co. Pvt. Ltd., Tamil Nadu	Kuttam, Chennai, Tamil Nadu, for ilmenite	150
Uranium ore	Uranium Corp. of India (Government, 100%)	Jaduguda, Jharkhand, Tummalpalle, Andhra Pradesh	5,190
Zinc	Binani Zinc Ltd. (Binani Industries Ltd., 89.9%)	Binanipuram smelter, Kerala	38
Do.	Hindustan Zinc Ltd. (HZL) (Sterlite Opportunities and Ventures Ltd., 64.9%, and Government, 29.5%)	Rampura, Agacha Mine, Rajasthan	6,150
Do.	do.	Sindesar Khurd Mine, Rajasthan	2,000
Do.	do.	Rajpura Dariba Mine, Rajasthan	900
Do.	do.	Kayad Mine, Rajasthan	350
Do.	do.	Zawar Mine, Rajasthan	1,200
Do.	do.	Chanderiya zinc smelter, Rajasthan	525
Do.	do.	Dariba smelting complex, Rajasthan	210
Do.	do.	Zinc smelter, Debari, Rajasthan	88
Do.	do.	Zinc smelter, Vizag, Andhra Pradesh	56

[e] Estimated. Do., do. Ditto. NA Not available.

[1] Formerly Orissa.

[2] Closed.

[3] Korba-I smelter was not operational.

[4] MALCO's smelter was closed in December 2008.

[5] Capacity of clusters of surface mines varies significantly. Estimated total capacity is 3.0 million metric tons per year.

TABLE 3
INDIA: EXPORTS OF SELECTED MINERAL COMMODITIES

Thousand metric tons unless otherwise specified

Commodity		2010	2011	2012	2013	2014
METALS						
Aluminum:						
Alumina[1]		703	428	861	567	707
Bauxite[1]		478	116	401	4,198	3,493
Metal and alloys		448	242	316	440	589
Copper, metal and alloys:						
Blister and anode		1	100	100	--	100
Ingots		1	3	3	3	2
Ore and concentrates		1	2	--	8	4
Refined copper		202	342	254	237	362
Scrap		6	7	6	6	6
Semifabricated		101	52	20	17	21
Gold:[1]						
Ore and concentrates (Au content)	kilograms	7,568	2,625	NA	82,031	57
Nonmonetary and monetary	do.	22,990	34,595	169,126	85,349	70,721
Nonmonetary, other unwrought forms	do.	NA	917,775	1,028,449	85,334	70,335
Iron and steel:						
Iron ore		95,931	39,156	28,432	14,426	9,844
Pig iron		752	1,197	394	1,063	835
Direct-reduced		69	70	126	117	167
Steel:						
Semifinished and finished		6,690	8,940	8,232	10,078	10,379
Ingots and semifabricated		430	552	585	1,074	1,661
Products:						
Flat		3,097	4,985	4,445	6,369	5,899
Long		621	949	707	776	908
Tubular		2,235	2,047	1,989	1,430	1,463
Ferroalloys		NA	1,483	1,725	1,910	1,667
Scrap		4,643	6,175	8,156	5,632	5,699
Zinc, metal and alloys:						
Ores and concentrates (Zn content)[1]		192	68	6	76	46
Zinc and alloys, scrap[1]		178	264	296	199	195
Metals		241	323	207	195	174
Lead, metal and alloys:						
Ore and concentrates[1]		36	122	30	14	7
Metal[1]		27	149	NA	30	58
Lead alloys, scrap[1]		54	286	241	47	81
INDUSTRIAL MINERALS						
Barite[1]		999	816	1,037	1,740	1,068
Cement		2,690	3,612	3,399	2,918	5,141
Diamond:[1]						
Industrial	thousand carats	770	923	252	1,702	2,121
Mostly cut	do.	66,091	78,994	62,654	65,561	83,851
Graphite, natural		846	1,900	2,217	922	2,790
Gypsum		NA	62,987	22,938	54,509	38,213
Potash		30	30	32	14	20
MINERAL FUELS AND RELATED MATERIALS						
Coal[1]		2,471	4,327	3,025	2,514	2,189
Coke, semicoke[1]		128	650	612	1,138	151
Liquefied gas		9	27	22	28	5
Petroleum, crude	thousand 42-gallon barrels	253	7	156	NA	NA

do. Ditto. NA Not available. -- Zero.

[1] Reported by fiscal year, which runs from April of the preceding year to March of that stated.

Sources: Indian Minerals Yearbook, 2010–14; World Steel Association, 2015; International Copper Study Group, 2015; and United Nations Comtrade database, 2010–14.

TABLE 4

INDIA: IMPORTS OF SELECTED MINERAL COMMODITIES

Thousand metric tons unless otherwise specified

Commodity		2010	2011	2012	2013	2014
METALS						
Aluminum:						
Alumina[1]		337	281	549	1,114	1,170
Bauxite		54	64	79	67	422
Metal and alloys, unwrought		219	233	292	348	345
Copper:						
Blister and anode		500	600	400	500	700
Ingots		910	4	4	3	4
Ore and concentrates		621	582	580	920	594
Semi-fabricated		104	139	134	180	227
Scrap		92	153	204	141	169
Refined copper		9	14	21	41	31
Gold:[1]						
Nonmonetary and monetary	kilograms	851,023	696,738	1,078,354	1,013,703	661,715
Nonmonetary, other semimanufactured forms	do.	4,760	51,961	49,905	98,310	53,288
Nonmonetary, other unwrought forms	do.	846,231	917,775	1,028,449	915,366	608,424
Iron and steel:						
Iron ore		450	1,316	2,882	1,115	7,413
Pig iron		256	11	12	46	27
Direct-reduced		39	422	1,069	671	178
Steel:						
Semi-finished and finished		9,744	9,213	9,341	7,392	9,477
Ingots and semifabricates		559	563	823	248	413
Products:						
Flat		7,289	6,896	6,868	5,648	6,744
Long		1,008	904	960	881	1,626
Tubular		674	813	642	576	657
Ferroalloys		220	260	285	258	301
Lead:						
Ore and concentrates		5	19	34	7	29
Metal		97	78	99	102	113
Zinc:						
Ores and concentrates		42	49	56	21	23
Metals		74	56	78	62	112
INDUSTRIAL MINERALS						
Barite[1]	metric tons	111	17	4,000	6,000	6,000
Cement		2,112	1,096	1,011	1,282	778
Diamond:[1]						
Industrial	thousand metric tons	2	104	19	53	3,136
Rough		130,101	182,227	152,811	135,730	146,612
Gypsum		1,567	2,337	2,818	3,011	4,066
Potash		5,189	4,618	2,842	2,123	3,395
MINERAL FUELS AND RELATED MATERIALS						
Coal[1]		73,257	69,918	102,841	145,790	166,861
Coke, semicoke[1]		2,356	1,490	2,365	3,077	4,167
Liquefied gas		9,111	9,766	13,200	13,136	13,021
Petroleum, crude	million 42-gallon barrels	1,143	1,139	1,233	1,381	1,408

do. Ditto.

[1] Reported by fiscal year, which runs from April of the preceding year to March of that stated.

Sources: Indian Minerals Yearbook, 2010–14; World Steel Association, 2015; International Copper Study Group 2015; and United Nations Comtrade database, 2010–14.

TABLE 5
INDIA: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Reserves
Apatite		2,100
Asbestos (all grades)		3,000
Ball clay		17,000
Barite		32,000
Bauxite		593,000
Calcite		3,000
Chalk		4,000
Chromite ore (all grades)		107,000
Coal, lignite		125,000,000
Copper, ore (gross weight)		238,000
Copper (Cu content)		3,000
Corundum	metric tons	600
Diamond	carats	1,000
Diaspore		3,000
Dolomite		738,000
Dunite		17,000
Feldspar		45,000
Fire clay		30,000
Fluorite		5,000
Garnet		19,000
Gold, ore (gross weight), primary		15,000
Gold (Au content)	metric tons	72
Graphite		8,000
Gypsum		39,000
Iron ore, crude ore		8,100,000
Kaolin		177,000
Kyanite		2,000
Lead and zinc ore		103,000
Lead (Pb content)		2,000
Limestone		15,000,000
Magnesite		21,000
Manganese ore		142,000
Mica		190
Monazite		12,000
Ochre		55,000
Perlite		400
Phosphate rock		70,000
Pyrophyllite		23,000
Salt (rock)		16,000
Silica sand and quartz		430,000
Sillimanite		4,100
Silver, ore (gross weight)		118,000
Silver (Ag content)		8
Talc/steatite/soapstone		90,000
Tin ore		7
Tin (Sn content)		1
Titanium:		
Ilmenite		594,000
Rutile		31,000
Vermiculite		1,700
Wollastonite		2,500
Zinc (Zn content)		11,000
Zircon		33,710
Zirconium		3,400

Source: Indian Bureau of Mines, 2014.

THE MINERAL INDUSTRY OF INDONESIA

By Susan Wacaster

The Indonesian archipelago is composed of about 17,500 islands that contain at least 15% of Earth's historically active volcanoes. About 80% of Indonesia's Cenozoic volcanoplutonic arc complexes are reported to contain mineral deposits, and the country's metallogeny is dominated by porphyry copper and epithermal gold deposits. Indonesia also has resources of commodities such as bauxite, coal, nickel, and tin, for which the country has been a regionally or globally top-ranked producer and exporter (Sillitoe, 1994, p. 1).

In 2014, a ban on exports of unrefined ores, which was implemented gradually by regulations imposed through the Mining Law of 2009, came into full effect. The Indonesian Government now requires that the beneficiation of ores take place domestically in order to make the country a producer of higher value finished goods rather than an exporter of raw materials. By January 2014, few mining companies in Indonesia had complied with the requirement to incorporate processing plants into their operations. Plans for about 100 smelter projects were submitted to the Government, but only 28 had broken ground and only one had been commissioned (Winzenried and Adhitya, 2014).

Exploration for hydrocarbons in Indonesia's sedimentary basins has taken place since the early 1900s and was officially promoted since the 1970s. The organic matter of Indonesia's main petroleum basins, which are an integral part of a group of paleogene and neogene basins that developed throughout southeast Asia, originated primarily from land plants and (or) algal lacustrine source materials, as opposed to marine sources, whereas important coal deposits in the country developed within interfingered marine and continental sediments (Doust and Noble, 2008, p. 106).

In 2014, Indonesia accounted for 36% of the crude petroleum produced by the leading petroleum-producing countries of southeast Asia, including Malaysia (29%), Thailand (19%), and Vietnam (16%). Among the region's natural-gas-producing countries, Indonesia led production with 30% of the total, followed by Malaysia (27%), Thailand (17%), Bangladesh (10%), Brunei (5%), and Vietnam (4%) (BP p.l.c. 2015, p. 8).

Minerals in the National Economy

Preliminary figures released by Indonesia's statistical agency (Badan Pusat Statistick) show that Indonesia's year-over-year real gross domestic product (GDP) rate of growth was 5.1% in 2014 and that the rate of growth had decreased each year since 2011 when it was 6.5%. The manufacturing sector, which includes liquefied natural gas (LNG) and petroleum refinery products processing but not production of mineral commodities, accounted for 26% of the GDP in 2014 and continued to be the leading sector of the Indonesian economy. Manufacturing of LNG and petroleum refinery products alone accounted for 1.5% of the GDP. The value of mining and quarrying of all mineral commodities accounted for 6.7% of the GDP in 2014 compared with 5.6% in 2013, and the mining sector accounted for about 15% to 20% of Indonesian exports on an annual basis in recent years (Badan Pusat Statistick, 2015).

Government Policies and Programs

In 2009, the Indonesian Parliament passed a new Mining Law [Law No. 4 of 2009 on Mineral and Coal Mining (Law No. 4)]. Prior to the passage of Law No. 4, foreign-owned companies seeking to conduct mining activities in Indonesia signed production-sharing contracts directly with the Government. The Contract of Work (COW) system was replaced with a two-stage permitting process [Izin Usaha Pertambangan (IUP) or permit to carry on mining business] that includes the issuance of an Exploration IUP and an Exploitation IUP. COWs that remained in effect were supposed to be adjusted to comply with the requirements of the new mining law. Among the requirements were the prohibition of exporting unprocessed minerals and the obligation to process and refine their product in Indonesia. Also, foreign shareholders in companies with an Exploitation IUP are required to divest shares within 10 years from the commencement of commercial production in order that the Government of Indonesia may achieve majority ownership. In 2012, the Government established a team to evaluate the adjustment of COWs and Coal Contracts of Work (CCOW) required by the 2009 law. In addition, the evaluation team was to enforce COW and CCOW holders' obligations regarding processing and refining of minerals and coal (Surowidjojo, 2012a, Scott and Tan, 2014).

Regulation No. 7 of 2012 on increasing the added value of minerals through processing and refining was passed on February 6, 2012, with the aim of developing the country's domestic mineral-processing industry and deriving more revenue from its mineral sector. Value-added minerals affected by the regulation included metals, nonmetallic minerals, coal, and stone. The regulation set out minimum levels of processing that the minerals must be subjected to prior to export and prohibits the export of minerals in raw form. The ban on unprocessed mineral exports was to be imposed gradually, beginning in May 2012, with full implementation in 2014. The regulation provides for cooperation among the holders of mining permits and other parties with respect to the sale and purchase of ores or concentrates, activities to undertake processing and (or) refining, and the joint development of processing and (or) refining facilities or infrastructure (Surowidjojo, 2012a, b).

On May 6, 2012, to discourage massive exports of raw minerals before the export ban came into full force, the Government also imposed a 20% duty on exports of 14 mineral ores that were not yet subject to the export ban, including copper, gold, and nickel. Later in the year, the list was extended to include 21 other mineral commodities. In total, 65 specific types of mineral ores and concentrates, not including coal, were subject to the duty. The duty was designed to increase revenues from the mining sector and was part of the Government's effort to push mining companies to process raw ore domestically and export higher value finished metals (Scott and Tan, 2014).

The Federal Government appealed to the Parliament to amend the Mining Law in order to extend the date for compliance with the processing requirement, but the appeal was denied, and the Government implemented a two-tier solution through the creation of new regulations. Government Regulation No. 1 of 2014, which addresses the value added through domestic processing and refining (GR1/2014), decreased the purity threshold for many minerals (excluding bauxite, chromium, gold, nickel, silver, and tin for which smelting capacity existed) for 3 years to allow the continued export of partially processed minerals. Commodities for which the purity level was decreased included copper, ilmenite, lead, manganese, titanium, and zinc. Under GR1/2014, the purity requirement for copper was reduced to 15% from 99%; ilmenite, to 56% from 98%; lead, to 57% from 99.8%; manganese, to 49% from various previous purity requirements; titanium, to between 56% and 58% from 98%; and zinc, to 52% from 90% (Scott and Tan, 2014).

According to the second regulation, Ministry of Finance Regulation No. 6 of 2014 (MoFR 6/2014), which addresses the determination of export goods that are subject to export duty and the export duty tariff, partially processed minerals are subject to an export duty during the 3-year period of reduced purity thresholds at a progressive rate commencing at 25% (for copper concentrates) and 20% for other specified concentrates and increasing to 60% after the 3-year period. Both GR1/2014 and MoFR 6/2014 apply to all mining companies, regardless of whether the company holds a COW or an IUP. It remained unclear, however, what would happen when the terms of any still-active COWs were in conflict with new regulations, and there were other inconsistencies that needed to be clarified regarding the compromises brought into effect through GR1/2014 and MoFR 6/2014. Also, the Ministry of Trade (MOT) and the Ministry of Energy and Mineral Resources (ESDM) announced an export regime on February 3, 2014, that requires all mineral exporters to be registered at the MOT and to undergo preshipment verification that the exporter has met the processing level of purity for processed minerals (Scott and Tan, 2014).

In December 2014, the Government issued GR 77/2014, which was the third amendment to the principal regulations of the mining law that described the maximum foreign share of ownership allowed by the type of mining license held by a mining company. For those businesses with an IUP or an Exploration Special Mining Business license (IUPK), a 75% ownership share is allowed. For foreign companies with Production Operation Mining Business Licenses (Production Operation IUP) or Production Operation Special Mining Business Licenses (Production Operation IUPK) that do not carry out their own processing and (or) refining activities, a 49% maximum share of ownership is allowed. A company with a Production Operation IUP or a Production Operation IUPK that carries out its own processing and (or) refining activities is allowed to hold a 60% share of ownership, and a foreign company with a Production Operation IUP that conducts underground mining is allowed to hold a 70% share of ownership. GR 77/2014 also sets out the progressive divestment requirements for foreign mining companies, which, for the previously described license holders, varies from 20% divestment by the 6th year to 51% divestment by the 10th year, as well as some instances whereby divestment is not required (Prior and Rifdaan, 2014).

Production

Data on mineral production are in table 1.

Structure of the Mineral Industry

State-owned PT Antam Tbk (Antam) produced bauxite, gold, nickel, and silver. Other state-owned companies—PT Krakatau Steel, PT Pertamina, PT Tambang Batubara Bukit Asam, and PT Tambang Timah Tbk—were engaged in the production of steel, oil, coal, and tin, respectively. Privately owned PT Indocement Tunggal Prakarsa Tbk was the leading cement producer in the country. International companies were active in Indonesia's metals mining and processing industries. Partially foreign-owned PT Freeport Indonesia Co. and PT Newmont Nusa Tenggara were engaged in the mining of copper and gold. PT Vale Indonesia Tbk produced nickel ore and matte, and PT Koba Tin produced tin ore and tin metal (table 2).

Mineral Trade

In 2014, the value of Indonesia's exported goods decreased for the third straight year to $173.8 billion compared with $180.3 billion in 2013. Owing in part to the ban on exports of unfinished ores, the value of exported mining products (including bauxite, coal, copper ore, natural gas, crude petroleum, and other unspecified mining products) decreased by 21% to $46.6 billion in 2014. The value of bauxite exports decreased by 96% to $47.7 million in 2014 compared with that of 2013 and nickel ore exports decreased by 95% to $85.9 million. Exports of copper ore decreased by 44% in 2014 compared with 2013 to $1.7 billion, and coal exports decreased by 15% to $20.8 billion. The value of natural gas and crude petroleum exports decreased in 2014 by 14.3% to $28.8 billion compared with that of 2013. Japan, Singapore, the Republic of Korea, and Taiwan were the leading recipients of Indonesia's gas and oil exports, accounting for 21%, 20%, 15%, and 14%, respectively, of the total or a combined 70% of the total (Bank of Indonesia, 2015).

The value of imported goods received by Indonesia decreased by 5% to $168 billion in 2014 compared with that of 2013. The value of imported mining products (including bauxite, coal, copper ore, natural gas, crude petroleum, and other unspecified mining products) increased by 17% in 2014 to $1.5 billion compared with that of 2013, but the increase was related primarily to a 258% increase in the value of coal imports, which amounted to $296 million in 2014. The value of bauxite and copper ore imports decreased by 66% and 71%, respectively, to $43 million and $280,000, and there was no imported nickel ore in 2014. China, Japan, Singapore, and Thailand were the leading suppliers of mining products, accounting for 24%, 13%, 8%, and 8%, respectively, or a combined 53% of the total value of imported goods. Owing to lower international prices for natural gas and crude petroleum, the value of Indonesia's gas and oil imports decreased by 6.3% to $40.6 billion in 2014 compared with that of 2013. The leading suppliers of gas and oil to Indonesia were Singapore, Saudi Arabia, Malaysia, and the Republic of Korea accounting, respectively, for 36%, 13%, 12%, and 10% of the total or a combined 71% of the total value of gas and oil imports (Bank of Indonesia, 2015).

Commodity Review

Metals

Bauxite and Alumina.—In 2013, Indonesia was the second-ranked bauxite producer in the world after Australia and the source of about 50% of the bauxite imported by China on an annual basis. Owing to Indonesia's ban on exporting bauxite ore, and a resultant 95% decrease in the country's bauxite production in 2014, global bauxite production decreased by more than 13% compared with that of 2013. In anticipation of the export ban, bauxite production in Indonesia increased by 81% in 2013 compared with that of 2012, and Indonesia's exports of bauxite ore to China increased by 18% in 2013 as China stockpiled about a 1-year supply of bauxite (Bray, 2015, 2016; Sedgman, 2014).

Production of bauxite and coal, combined, which made up one of Antam's five operating units, accounted for 2% of the company's total sales in 2014. Antam's bauxite ore was produced by the Bauxite Mining Business Unit, which operated the Tayan bauxite mine in Kalimantan. In accordance with Law No. 4 of 2009, Antam did not export bauxite ores in 2014, and the company's production was 267,292 metric tons (t) in 2014 compared with 570,721 t in 2013 (Aneka Tambang PT Persero Tbk, 2015, p. 6, 133).

Copper.—In July 2014, PT Freeport Indonesia Co. (PT–FI) entered into a Memorandum of Understanding (MOU) with the Government of Indonesia by which the parties agreed to negotiate amended provisions of the company's COW related to the size of PT–FI's concession area, royalties and taxes, domestic processing and refining, divestment, and the continuation of operations from 2022 through 2041. Other negotiations of the amended COW were to address the development of new copper smelting and refining capacity in Indonesia and the divestment of ownership to the Government and (or) Indonesian nationals of up to 30% interest in PT–FI. Execution of the MOU allowed for the resumption of concentrate exports, which had been suspended since January 2014, but PT–FI remained involved in discussions with the Government regarding an amended COW. Effective with the signing of the MOU, PT–FI provided a $115 million assurance bond for smelter development, agreed to increase royalties to 4% for copper and 3.75% for gold from the previous rates of 3.5% for copper and 1% for gold, and to pay yet-to-be-determined export duties. Under the MOU, no terms of the COW other than those related to export duties, the smelter bond, and royalties would be changed until the completion of an amended COW. PT–FI's recoverable copper production in 2014 was 295,268 t (Freeport McMoRan Inc., 2014, p. 8).

Gold.—PT–FI was the leading gold producer in Indonesia in 2014. The company produced 35,205 kilograms (kg) of gold, or 51% of the country's total reported gold production in 2014, which was a decrease of 0.7% compared with that of 2013. The processing and refining unit of the Logam Mulia Refinery was Indonesia's only precious metals refinery, which had a capacity of 60,000 kg of gold. In 2014, ANTAM's gold production volume from Pongkor and Cibaliung decreased by 9% to 2,335 kg compared with that of 2013 owing to lower grades of gold ores at the mines (Aneka Tambang PT Persero Tbk, 2015, p. 6).

Tin.—Indonesia accounted for 32% of world tin production in 2013 and 17% in 2014, and the country was the world's leading exporter of tin metal in 2014. Exports from Indonesia, however, decreased to their lowest level since at least 2006 owing to the combined effects of Indonesia's export restrictions and decreasing global tin prices. Shipments decreased by 17% to 75,925 t in 2014 from 91,613 t in 2013 (Anderson, 2015, 2016; Rusmana, 2015).

Mineral Fuels and Related Materials

Coal.—In January 2015, the Indonesian Coal Mining Association advised the Government to decrease production by at least 50 million metric tons (Mt) in 2015 and to limit exports to 300 Mt after global coal prices decreased to record lows in 2013, and the annual average price of Indonesia's coal decreased by about 42% between 2011 and yearend 2014. The Government had set a production limit of 400 Mt in 2014, and typically set annual coal production limits, but these were exceeded as miners attempted to offset low coal prices by increasing production. At the same time that the country was implementing production caps, the Government planned to offset the state budget revenue lost from the petroleum and gas sector by increasing royalties for coal mining companies. Royalty fees were proposed to increase to 9% from 5% for coal with a calorific content between 5,100 kilocalories per kilogram (kcal/kg) and 6,100 kcal/kg. Royalty fees for coal with a calorific content greater than 6,100 kcal/kg would increase to 13.5% from 7%. The country expected to produce 425 Mt of coal in 2015 with 333 Mt projected for export compared with the production of 435 Mt and the export of 359 Mt in 2014 (Oxford Business Group, 2015).

Petroleum.—Indonesia is a former member of the Organization of the Petroleum Exporting Countries and was once the leading oil producer in Southeast Asia. The main oil-producing regions include the Java Sea, East Kalimantan, and Sumatra. Of Indonesia's 60 sedimentary basins, 14 are in production. Another 39 basins have been identified as having strong potential for hydrocarbon resources, but a lack of exploration has resulted in dwindling reserves.

In October 2014, petroleum production commenced at the Banyu Urip field in Indonesia's Cepu Block in Central Java and East Java. The Cepu Block was owned by Mobil Cepu Ltd. (a subsidiary of Exxon Mobil Corp. and Ampolex Cepu PTE Ltd.), 45%; PT Petamina EP Cepu Pt., 45%; and the Cepu Block Cooperation Body (which was made up of four local government companies), 10%. The Banyu Urip field was expected to have peak production of 165,000 barrels per day of petroleum from 49 wells (ExxonMobil Corp., 2015; Wulandari, 2014).

Outlook

The outlook for Indonesia's mineral industry is characterized by high risk in terms of foreign investment. The Fraser Institute ranked Indonesia as the lowest of the 96 countries that it evaluated in terms of its policy potential index, which ranks the relative friendliness of Government policies towards the mining sector, compared with a ranking of 85 out of 96 in 2013. The strategies applied by the Government to retain more of the value of the country's mineral resources combined with divestment rules, dwindling global commodity prices, and decreased consumption by China may all combine to discourage new long-term investment in Indonesia or additional investment by companies that have already made significant financial commitments in the country (Winzenried and Adhitya, 2014; Jackson and Green, 2015, p. 9).

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TABLE 1

INDONESIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
METALS						
Aluminum:						
Bauxite, wet basis, gross weight	thousand metric tons	27,410	40,644	31,443	57,024 [r]	2,555
Metal, primary		253,300	244,100	248,000	255,300	210,500
Chromite sand, dry basis[e]		4,000 [r]	12,000 [r]	10,000 [r]	19,000 [r]	7,000
Cobalt, mine, Co content[e]		1,600	3,200	3,600	4,700	329
Copper:						
Mine, Cu content		878,376	535,000	394,000	504,000	405,600
Metal:						
Smelter, primary		262,700	276,200	198,400	217,700	175,000 [e]
Refinery, primary		278,892	276,000	197,200	214,300	175,000 [e]
Gold, mine output, Au content	kilograms	106,316 [r]	77,722 [r]	69,291	59,804 [r]	69,100
Iron and steel:						
Iron sand, dry basis	thousand metric tons	8,976	11,815	11,546	11,500 [e]	11,000 [e]
Metal:						
Ferroalloys:						
Ferronickel		93,300	98,200	91,600	91,000	84,000
Ferromanganese[e]		12,000	12,000	13,000	12,000	12,000
Silicomanganese[e]		8,000	8,000	9,000	8,000	8,000
Pig iron, direct-reduced iron	thousand metric tons	1,274	1,228	524	757	600 [e]
Steel, crude	do.	3,664	3,621	2,254	2,644	3,000
Steel, semimanufactured[e]	do.	4,900	5,100	5,000	5,000	5,000
Manganese:						
Ore and concentrate, gross weight		207,400	119,100	138,000	120,000 [e]	120,000 [e]
Mn content		72,600	41,700	39,500	38,000 [e]	38,000 [e]
Nickel:						
Mine output, Ni content		300,800	564,400	648,400	834,200	55,284
Matte, Ni content		78,400 [r]	67,800 [r]	69,000 [r]	78,800 [r]	78,700
Ferronickel, Ni content		18,688	19,700	18,400	22,800	20,000 [e]
Silver, mine output, Ag content	kilograms	288,717 [r]	227,173	247,827 [r]	123,109 [r]	116,045
Tin:						
Mine output, Sn content		46,078	43,258	49,300	45,800	38,545
Metal[3]		51,418	43,832	51,400	48,800	58,233
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	37,800	52,000	60,600	65,000 [e]	65,000 [e]
Diamond:[e]						
Industrial	thousand carats	30	30	31	30	30
Gem	do.	7	7	7	7	7
Total	do.	37	37	38	37	37
Nitrogen, N content of ammonia[e]	thousand metric tons	4,800	5,000	5,100	5,000	5,000
Stone, granite	do.	2,172	3,317	3,500 [e]	4,000 [e]	4,000 [e]
MINERAL FUELS AND RELATED MATERIALS						
Coal	thousand metric tons	224,677 [r]	291,165 [r]	361,028	377,847 [r]	435,000
Natural gas	million cubic meters	82,000	75,900	71,100	70,400	75,000
Petroleum, crude, including condensate	thousand 42-gallon barrels	341,228 [r]	329,249	314,666	301,199 [r]	289,100

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto.

[1] Table includes data available through July 30, 2015.

[2] In addition to the commodities listed, Indonesia also produced dolomite, feldspar, gypsum, ilmenite, limestone, marble, nitrogen from ammonia, phosphate rock, quartz sand, salt, silica stone, sulfur, zeolites, and zirconium but available information is inadequate to make reliable estimates of output.

[3] Tin output from small tin smelters is not available but may be as much as 40,000 metric tons per year.

TABLE 2
INDONESIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Locations of main facilities	Annual capacity[e]
Aluminum:				
Bauxite		PT Antam Tbk (Government, 65%)	Kijang, Bintan Island, Riau	1,300
Do.		do.	Kalimantan, Borneo	600
Metal		PT Indonesia Asahan Aluminum (Nippon Asahan Aluminum Co. Ltd., 59%, and Government, 41%)	Kual Tanjun, North Sumatra	250
Cement		PT Indocement Tunggal Prakarsa Tbk	Cirebon and Citeureup, West Java; Tarjun, South Kalimantan	18,600
Do.		PT Semen Andalas Indonesia (Lafarge S.A., 99%)	Besar, Aceh	1,400
Do.		do.	Lhok, Aceh	1,600
Do.		PT Semen Baturaja	Baturaja-Ogan Komering Ulu, South Sumatra	1,250
Do.		PT Semen Bosowa Maros	Kabupaten Maros, Sulawesi Selatan	1,800
Do.		PT Holcim Tbk	Narogong, East Java	9,700
Do.		PT Semen Gresik Tbk	Gresik and Tuban, East Java	10,700
Do.		PT Semen Padang	West Sumatra	5,440
Do.		PT Semen Tonasa	Pangkep and Tonasa, South Sulawesi	6,000
Coal		PT Adaro Indonesia (New Hope Corp., 50%; PT Asminco Bara Utama, 40%; Mission Energy, 10%)	Paringin and Tutupan, South Kalimantan	35,000
Do.		PT Arutmin Indonesia (PT Bumi Resources Tbk, 80%, and Bakrie Group, 20%)	Mulia, Senakin, and Satui, South Kalimantan, and Asam-Asam, East Kalimantan	20,000
Do.		PT Berau Coal (PT United Tractor, 60%; PT Armadian, 30%; Nissho Iwai, 10%)	Berau, East Kalimantan	13,000
Do.		PT Kaltim Prima Coal Co. (PT Sitrade Coal, 32.4%; Bhira Investments Ltd., 30%; Sangatta Holding Ltd., 9.5%; Kalimantan; Coal Ltd., 9.5% Kutai Timur Sejahtera, 5%)	East Kutai Regency, East Kalimantan	55,000
Do.		PT Kideco Jaya Agung (Samtan Co. Ltd., 100%)	Pasir, East Kalimantan	12,000
Do.		PT Tambang Batubara Bukit Asam (stateowned)	Tanjung Enim and Ombilin, South Sumatra	19,000
Do.		United Tractors	Central Kalimantan and East Kalimantan	6,500
Copper:				
Concentrate		PT Freeport Indonesia Co. (Freeport-McMoRan Copper & Gold Inc., 90.64%, and Government, 9.36%)	Grasberg Mine, Papua	600
Do.		PT Newmont Nusa Tenggara (Nusa Tenggara Partnership B.V., 56%; PT Multi Daerah Bersaing, 24%; PT Pukuafu Indah, 17.8%; PT Indonesia Masbaga Investama, 2.2%)	Sumbawa Island, West Nusa Tenggara	300
Metal		PT Smelting Co. (Mitsubishi Materials Corp., 60.5%; PT Freeport Indonesia Co., 25%; others, 14.5%)	Gresik, East Java	270
Gas:				
Natural	millon cubic meters per day	ExxonMobil Oil Indonesia	Arun and Aceh, North Sumatra	48
Do.	do.	Roy M. Huffington (subsidiary of HUFFCO Group)	Badak, East Kalimantan	28
Do.	do.	Total Indonesia	Offshore East Kalimantan	59
Liquefied		PT Arun LNG Co. Ltd. (Government, 55%; Mobil Oil Co., 30%; Japan Indonesia LNG Co., 15%)	Balang Lancang amd Aceh, North Sumatra	12,500
Do.		PT Badak LNG Co. Ltd. (Government, 55%; HUFFCO Group, 30%; Japan Indonesia LNG Co., 15%)	Bontang, East Kalimantan	22,500
Coalbed methane		Ephindo Energy Pvt. Ltd. (PT Pertamina, 52%, and Dart Energy Ltd., 24%)	Sangatta, East Kalimantan	22,600
Gold	metric tons	Bluenose Gold Corp., 80%, and Zinton Investments Ltd., 20%	Buduk, Mine East Kalimantan	NA
Do.	do.	G Resources Group Ltd., 95%	Martabe Mine, Sumatera Utara	8
Do.	do.	Indo Resources Pacific Inc., 75%	Woyla Mine, Aceh	1
Do.	do.	Kingrose Mining Ltd., 85%, and private Indonesian investors, 15%	Way Linggo Mine, Lampung	1
Do.	do.	Newcrest Mining Ltd., 75%, and PT Antam (Persero) Tbk, 25%	Gosowong Mine, Maluku Utara	14

See footnotes at end of table.

TABLE 2—Continued

INDONESIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Locations of main facilities	Annual capacity^e
Gold—Continued	metric tons	Newcrest Mining Ltd., 85%, and PT Antam (Persero) Tbk, 15%	Toguraci Mine, Maluku	NA
Do.	do.	PT Freeport Indonesia Co. (Freeport-McMoRan Copper & Gold Inc., 81.28%, and others, 9.36%)	Ertsberg and Grasberg, Papua	110
Do.	do.	Private Indonesian investors, 55%	Mirah Mine, Kalimantan	1
Do.	do.	Private owner, 100%	Manado Mine, Sulawesi Utara	NA
Do.	do.	PT Antam (Persero) Tbk, 100%	Logam Mulia Refinery Jakarta Raya, Jakarta	60
Do.	do.	do.	Cibalung Mine, Banten and	1
Do.	do.	do.	Pongor Mine, Jawa Barat	3
Do.		PT Newmont Nusa Tenggara (Newmont Mining Corp., 45%; Sumitomo Corp., 35%; PT Pukuafu Indah, 20%)	Sumbawa Island, West Nusa Tenggara	NA
Do.	do.	PT J Resource Asia Pasifik Tbk, 100%	Seruyung Mine, Kalimantan Timur	2
Do.	do.	PT J Resource Asia Pasifik Tbk, 80%	Bakan Mine, Sulawesi Utara	46
Do.	do.	PT Rajawali Corp., 100%	Toka Tindung Mine, Sulawesi Utara	5
Do.	do.	Straits Resources Ltd., 100%	Mt Muro Mine, Kalimantan Tengah	6
Do.	do.	PT J Resource Asia Pasific Tbk, 79.10%, and local interest, 0.90%	North Lanut Mine, Sulawesi Utara	NA
Nitrogen		PT Asean-Aceh Fertilizer (Government, 60%, and other members of the Association of Southeast Asian Nations, 40%)	Lhokseumawe, North Sumatra	500
Do.		PT Pupuk Iskandar Muda (Government, 100%)	do.	500
Do.		PT Pupuk Kalimantan Timur (Government, 100%)	Bontang, East Kalimantan	1,850
Do.		PT Pupuk Kujang	Cikampek, West Java	330
Do.		PT Pupuk Sriwijawa (Government, 100%)	Palembang, South Sumatra	1,440
Petroleum:				
Crude	thousand barrels per day	BP Indonesia (a subsidiary of BP p.l.c.)	Arjuna and Arimbi, offshore West Java	170
Do.	do.	China National Offshore Oil Co.	Offshore southeastern Sumatra	100
Do.	do.	Maxus Southeast Asia Ltd. (subsidiary of Maxus Energy)	Cinta and Rama, offshore southeast Sumatra	95
Do.	do.	Mobil Cepu Ltd., 45%; Ampolex Cepu PTE Ltd., 45%; Cepu Block Cooperation Body, 10%	Cepu Block, Central Java and East Java	165
Do.	do.	PT Pertamina (Government, 100%)	Jatibarang, West Java, and Bunyu, offshore East Kalimantan	80
Do.	do.	PT Caltex Pacific Indonesia (Texaco Inc., 50%, and Chevron Corp., 50%)	Minas, Duri, and Bangko, central Sumatra	700
Do	do.	Total Indonesie (subsidiary of Total S.A.)	Handi and Bakapai onshore and offshore East Kalimantan	180
Refined	do.	PT Pertamina (Government, 100%)	6 locations	1,000
Silver		PT Antam Tbk (Government, 65%)	Bogor, West Java	25
Do.		PT Freeport Indonesia Co. (Freeport-McMoRan Copper & Gold Inc., 81.28%; Government, 9.36%; others, 9.36%)	Ertsberg and Grasberg, Papua	220
Do.		PT Kelian Equatorial Mining (Rio Tinto Group, 90%, and PT Harita Jaya Raya, 10%)	180 kilometers west of Samarinda	10
Steel, crude		PT Ispat Indo	Sidoarjo, Surabaya	700
Do.		PT Krakatau Steel (Government, 100%)	Cilegon, West Java	2,400
Do.		PT Komatsu Indonesia Tbk	Jakarta	8
Do.		PT Wahana Garuda Lestari	Pulogadung, Jakarta	410
Tin:				
In ore		PT Koba Tin (Malaysia Smelting Corp., 75%, and PT Tambang Timah Tbk, 25%)	Koba, Bangka Island	25
Do.		PT Tambang Timah Tbk (Government, 65%)	Onshore and offshore islands of Bangka, Belitung, and Singkep	60
Metal		Mentok Tin Smelter (PT Tambang Timah Tbk)	Mentok, Bangka Island, South Sumatra	68
Do.		Koba Tin Smelter (PT Koba Tin)	Koba, Bangka Island, South Sumatra	25

^{e}Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

THE MINERAL INDUSTRY OF JAPAN

By Susan Wacaster

Japan's reserves of iodine are the greatest of any country in the world, and its production of iodine was second to that of Chile in 2014. Japan has one of the world's leading mineral processing sectors, and in 2014, the country maintained a reliance on imported mineral commodities to supply its manufacturing sector. In 2014, Japan was the world's second-ranked producer of steel after China, but Japan's production accounted for 6.7% of world production whereas China's production accounted for 50.1% of the total. Japan was the world's third-ranked cadmium metal producer, accounting for 8.2% of total production; China and the Republic of Korea produced 33% and 18%, respectively, of the total. Japan was also the world's third-ranked producer of indium metal, accounting for 8.5% of total production, after China and the Republic of Korea, which accounted for 54.5% and 17.8%, respectively, of the total (World Steel Association 2015a, b; Schnebele, 2016; Tolcin, 2016a, b).

Minerals in the National Economy

Japan's nominal gross domestic product (GDP) decreased by 6.5% to $4.6 trillion in 2014, which was the world's third-ranked GDP after the United States ($17.4 trillion) and China ($10.4 trillion). The year-over-year percentage change in Japan's GDP was not more than 2.4% in any year from 1994 through 2013, with the exception of 2010 when the GDP decreased by 6.0% compared with that of 2009. Japan's mining sector had not accounted for more than 0.2% of the GDP during any year from 1994 through 2013 (the last year for which data were available). The manufacturing sector accounted for between 18% and 22% of GDP during the same period. The combined value contributed to the GDP from the production of coal, iron, fabricated metal products, nonferrous metals, nonmetallic mineral products, petroleum, and steel accounted for between 4% and 5% of the GDP from 1994 through 2013. The value of the production of these same commodity groups accounted for between 22% and 28% of the total value of manufacturing each year between 1994 and 2013 (Japan Statistics Bureau, 2015a, b; World Bank, The, 2015).

Government Policies and Programs

Japan's Mining Act of 1950 (Law number 289 of 1950), replaced the Mining Act (Law number 45 of 1905) and the Placer Act (Law number 13 of 1909). In 1950, the Government of Japan approved the Commodity Exchange Act (Law number 239), which allowed for the establishment of commodities exchanges and the trading of commodities, including minerals. In 1967, the Japan Petroleum Development Corporation (JPDC) was created to fund and promote exploration and development of foreign crude petroleum resources (Ministry of Economy, Trade and Industry, 2006; Japan Oil, Gas and Metals National Corp., 2015a).

In 1963, the Metallic Minerals Exploration Financing Agency (MMEF) of Japan was created to strengthen the competitiveness of Japan's metal mining industry and to secure a stable, economical supply of metals. The MMEF's primary role was to provide loans necessary for the exploration of metallic minerals. In 1973, the Government expanded and reorganized the MMEF by creating the Metal Mining Agency of Japan (MMAJ). The MMAJ replaced the MMEF and was given responsibility for all mining related policies. That same year, an act that implemented special measures for pollution caused by the metal mining industry, Law number 26, was passed in order to address mine pollution from suspended or abandoned mines and other mineral facilities. In 2004, Japan National Oil Company (JNOC) and MMAJ were merged to establish the Japan Oil, Gas and Metals National Corporation (JOGMEC), which integrated the responsibilities formerly handled by the JNOC and MMAJ (Kikkawa, 2013). The Agency for Natural Resources and Energy, a part of the Ministry of Economy, Trade and Industry (METI), is responsible for formulating Japan's mineral policies, which are implemented by JOGMEC. The objective of the country's overall mineral policy is to secure a stable supply of mineral resources and mineral fuels from abroad for the country to sustain continuous economic growth (Kikkawa, 2013).

In 2012, to stimulate domestic natural resource development, the Government of Japan amended the country's Mining Act to strengthen the regulatory powers of the METI in terms of granting mining rights. Prior to the 2012 revisions, applicants were granted mining rights on a first-come-first-served basis without reviewing the financial and technical capabilities of the applicants, and there were few or no restrictions on the methods of exploration that were allowed. As a result, many applications were submitted to gain the rights to a property, but never proceeded with development. By 2010, the Japanese Government had granted 8,179 exploration licenses for mining areas, of which 1,558 or about 19% had been developed to the production stage (Kikkawa, 2013).

The 2012 amendments to the Act defined two classes of minerals (Specified minerals and Nonspecified minerals) and two different application processes for mining rights to each class of minerals. Specified minerals are defined as those that the Government of Japan designated as particularly important to the national economy (including crude petroleum and natural gas). Nonspecified minerals seem to include all minerals that are not defined as Specified minerals. The first-to-file system will still apply for Nonspecified minerals, but applicants for both types of minerals will have to demonstrate financial solvency and technical capabilities to carry out development of a site (Clifford Chance LLC, 2012).

Production

In 2014, production of primary aluminum increased by 58% to 45,853 metric tons (t) compared with that of 2013. The average of annual primary aluminum production in Japan from

2000 through 2014 was about 42,000 t. Production lows in 2012 and 2013 of about 26,000 t and 29,000 t, respectively, were primarily owing to the effects of the 2011 Tohoku earthquake that damaged infrastructure and eliminated readily available sources of power for aluminum manufacturing. Antimony metal production decreased by 32% in 2014 compared with that of 2013 to 94 t. Production of antimony metal in Japan has been decreasing for decades as the production increased in countries that produced the metal from domestic or imported ore. In 2014, there was a 21% increase in the production of refined nickel and a 33% increase in the production of refined cobalt. These increases were a result of the processing of stockpiled ore that was acquired from Indonesia (Japan's main supplier) prior to a ban on exporting unprocessed ores, which was fully implemented in 2014. Production of almost all petroleum refinery products has decreased steadily in recent years owing primarily to a Government regulation enacted in 2010 that requires Japanese petroleum refineries to upgrade their heavy oil cracking units or reduce their crude distillation unit capacities. (table 1).

Structure of the Mineral Industry

In 2014, Japan's mineral sector was made up of the nonferrous metals industries, nonmetals (industrial minerals) industries, and quarrying (construction materials) industries. The mining of coal and nonferrous metals was a small industry in Japan, but the industrial mineral production and processing of ferrous and nonferrous metals were large industries. Only a few metal mines were still in operation in Japan, including the Hishikari gold mine in Kagoshima Prefecture. The country's mineral industry was primarily owned and operated by private companies (table 2).

In 2012, the latest year for which data were available, there were 1,825 direct mining enterprises in Japan, including 1,533 quarries (gravel, sand, and stone), 197 mines producing minerals for the ceramics industry, 41 enterprises that were affiliated with natural gas and crude petroleum production, 14 enterprises engaged in both coal and lignite mining and metal mining, 40 enterprises involved in the mining of other minerals, and another 86 enterprises engaged in the administrative or ancillary economic activities related to direct mining enterprises. Mining enterprises employed 21,427 people in their operations of those mining enterprises (Japan Statistics Bureau, 2015b).

Mineral Trade

In 2014, the value of Japan's exports decreased by 3.5% to $694 billion and that of imports decreased by 2.6% to $817 billion for a trade deficit of $123 billion. Japan is the world's 5th largest consumer of electricity. Until 2011, nuclear powerplants produced about one-third of Japan's total power supply. In 2011, however, in the aftermath of the Tohoku earthquake and the subsequent meltdowns at the Fukushima nuclear facility, all 50 nuclear powerplants were gradually shut down. Fossil fuel imports have increased continually since that time and have resulted in Japan becoming a net importing country in terms of the value of total trade for the first time in decades (Organisation for Economic Co-operation and Development, 2014, p. 6; Japan External Trade Organization, 2015a).

The United States was Japan's leading export market in 2014, accounting for 18.6% of the value earned from exports, followed by China, which accounted for 18.3%. Other leading recipients of Japan's exports in order of value, included the Republic of Korea, Taiwan, Hong Kong, Thailand, Singapore, Vietnam, Indonesia, and Malaysia, the combined value of which accounted for another 39% of the total value of Japan's exports. Japan's leading import partner was China, which accounted for 22.3% of the value of Japan's imports. Other leading suppliers to Japan were, in order of value, the United States, Australia, Saudi Arabia, the United Arab Emirates, Qatar, the Republic of Korea, Malaysia, Indonesia, Russia, Taiwan, Germany, and Thailand, and the combined value of Japan's imports from these countries accounted for another 20.7% of the total (Japan External Trade Organization, 2015a).

The value of Japan's commodity exports continued to be led by transportation equipment, including motor vehicles, motor vehicle parts, and ships, followed by machinery and manufactured goods. Japan's exports of manufactured goods decreased by 4.9% in 2014 to $90 billion and accounted for 13% of commodity exports in 2014. By value, iron and steel products were the leading exported manufactured goods. The value of iron and steel exports decreased by 3.8% in 2014 to $37 billion compared with that of 2013 and accounted for 5.4% of all commodity exports. The value of exported nonferrous metals, manufactured metal products, and nonmetallic mineral products decreased in 2014 by 5.8%, 3.9%, and 8.2%, respectively, and the combined total of these goods accounted for 4.8% of all exported commodities. Mineral fuels were Japan's leading import commodity in 2014, accounting for 32.3% of the value of all imported goods. The value of Japan's imported mineral fuels in 2014 decreased by 7.1% to $264 billion owing, in part, to decreased global prices for petroleum products but also owing to decreased demand within some prefectures of the country (Japan External Trade Organization, 2015a).

Commodity Review

Metals

Aluminum.—The Japanese aluminum industry mainly consists of rolling, extrusion, and diecasting companies that manufacture products for construction, packaging, and transportation. In 2012, the last year for which data were available, there were 51 aluminum companies in Japan with 69 plants, which employed 13,000 employees (Japan Aluminium Association, 2013, p. 1).

Japan is Asia's leading importer of aluminum and the quarterly prices that Japan agrees to pay for primary aluminum metal imports set the benchmark for the region. In September 2014, some but not all Japanese consumers agreed to pay Rio Tinto Ltd. $420 per ton for metal that would be shipped in the October quarter. The agreed-upon price was between $15 and $40 per ton less than offers from Alcoa Inc., BHP Billiton Ltd., and United Company RUSAL Plc, but an increase of about 4% compared with the July 2014 quarter and between 8% and 12% compared with the April 2014 quarter (Obayashi, 2014).

In 2014, Japan produced 45,853 t of primary aluminum, 142,512 t of unalloyed secondary aluminum ingot, and 11,783 t of aluminum powder. Production of aluminum mill products included 1.2 Mt of flat rolled products and 820,100 t of extruded products. Japan's imports of aluminum waste and scrap in 2014 increased by 37% to 75,900 t. Japan's imports of unwrought aluminum included 1.7 Mt of unalloyed aluminum and 1.1 Mt of alloyed aluminum, which were increases of 15.8% and 11.0%, respectively, compared with 2013. A total of 122,900 t of wrought aluminum products were imported, which was an increase of 8.6% compared with 2013, including 61,700 t of plates, sheets, and strips; 18,200 t of bars, rods, and profiles; 2,500 t of pipes and tubes; and 35,500 t of foil (Japan Aluminium Association, 2015).

Japan's domestic demand for aluminum increased by 4.1% compared with 2013 to 4.1 Mt. In terms of end use, demand was led by the transportation industry, which accounted for 40.2% of the total. The building and construction industries accounted for 13.5% of the total. Production of fabricated metal products and demand from the food industry accounted for 11.7% and 10.7%, respectively, of the total. The electrical appliance and communication machinery industries accounted for 3% of demand, the industrial machinery industry accounted for 2.3%, and the electrical conductor and chemical industries each accounted for less than 1% of the total. Other unspecified uses and exports accounted for the remainder of the total (Japan Aluminium Association, 2015).

Antimony.—In 2014, Japan produced 94 t of antimony metal, which was a 32.4% decrease compared with 2013. Japan had a history of mining stibnite veins until the mid-1950s, but as reserves dwindled and less expensive imports became available, Japanese companies have produced antimony metal and derivative chemicals from imported materials (Clarke, 2012; Japan Mining Industry Association, 2015, p. 4).

Japan imports high-purity antimony lump and powder, antimony trioxide, and antimony trisulfide. In 2013 (the latest year for which data were available), Japan imported a total of 9,295 t of antimony compounds, of which antimony lump and powder accounted for 57.9%; antimony trioxide, 38.5%; and antimony sulfide, 3.6%. The total of antimony compounds imported by Japan had decreased almost every year since at least 2004 when the total import amount was 14,977 t. In 2010, however, the total tonnage of antimony imports increased by 67% compared with that of 2009 (Japan Oil, Gas and Metals National Corp., 2014a).

Cadmium.—Cadmium metal production is a byproduct of zinc processing and the amount of cadmium produced in Japan had remained relatively constant since at least 2000 as there was no refinery capacity expansion and little variation in the amount of zinc metal that was produced. The average annual production total from 2000 through 2014 was 2,127 t, and the maximum and minimum production totals were 2,509 t and 1,755 t, respectively. In 2010 (the last year for which industrial end use data were available), Japan's total cadmium metal supply, from domestic production, imports, and any stocks from the previous year, was 5,497 t. About 82% of domestic consumption of cadmium metal was accounted for by the production of batteries; 1% was consumed in the production of alloys, pigments, plated products, and other unspecified uses, and 7% was exported, leaving the remainder of the supply as ending stocks (Japan Oil, Gas and Metals National Corp., 2012).

Copper.—Production of copper from domestic ore had not contributed to Japan's supply of refined copper since 2007, when the last reported production volume of domestic ore was 100 t. Refined copper production from imported ore remained relatively constant in recent years despite shocks to the economy and infrastructure, including recession and natural disaster. The average of Japan's annual refined copper production from imported ore in 2004 through 2014 was 1.3 Mt with a maximum production volume in 2014 of 1.5 Mt and a minimum in 2011 of 1.1 Mt. Japan's copper production from imported ore during the same period accounted for between 82% and 88% of the country's total supply and the rest was produced from imported scrap or unclassified materials (Japan Oil, Gas and Metals National Corp., 2014b, p. 3; Japan Mining Industry Association, 2015, p. 11).

The average of Japan's total annual refined copper supply from 2004 through 2014 (including that produced from imported ore, scrap, unclassified materials, and imports of refined copper) was 1.7 Mt, with a maximum of 1.8 Mt in 2003 and a minimum of 1.6 Mt in 2007. The average of Japan's total annual refined copper consumption from 2004 through 2014 (including that consumed by the production of electric wire, unclassified copper products, other unclassified uses, and exports of refined copper) was 1.5 Mt with a maximum of 1.6 Mt in 2007 and a minimum of 1.4 Mt in 2000. In 2014, Japan's stocks of copper ore at the beginning of the year decreased by 41% to 86,805 t, which was the lowest amount of any year since at least 2004. Total consumption in 2014 did not decrease, yet production of primary refined copper decreased by 8% compared with that of 2013 (table 1; Japan Oil, Gas and Metals National Corp., 2014b, p. 3; Japan Mining Industry Association, 2015, p. 11).

Iron and Steel.—In 2014, pig iron production remained nearly constant, increasing by just 0.03% compared with 2013 to 83.9 Mt. Of that amount, 99.6% was used for steelmaking processes and the rest was used for foundry applications. Crude steel production also remained nearly unchanged (increased by 0.06% compared with that of 2013 to about 111 Mt). Of that amount, 77.2% was classified as ordinary steel and the rest was specialty steel. A total of 97.9 Mt of hot-rolled products was produced in 2014, which was an increase of 1% compared with that of 2013, and production of finished products increased by 1.2% to 95.3 Mt (table 1; Japan Iron and Steel Federation, 2015).

From 2004 through 2013 (the last year for which industrial demand data were available) Japan's supply of iron and steel (from the production of ordinary and special steels, steel casting and forging, pig iron casting, and imports of the same) exceeded demand (from manufacturing and exports) every year since at least 2004. Between 2004 and 2013, domestic demand decreased for many industries, including automobile manufacturing, construction, container production, business and household equipment, electrical machinery, industrial machinery, railway vehicle production, and shipbuilding (Japan Oil, Gas and Metals National Corp., 2014c, p. 231).

Lead.—Japan's production of primary refined lead was wholly from imported ore. Primary lead production volumes varied little in Japan since at least 2004, with the exception of recession years including 2004, when Japan was emerging from a decade of deflation and decreased real GDP growth; in 2009 after the global economic recession; and again in 2012 and 2013 owing to domestic disruption caused by the Tohoku earthquake in 2011. The average volume of Japan's annual primary lead production from 2004 through 2014 was 99,200 t with a maximum production volume in 2008 of 100,700 t and a minimum in 2004 of 89,000 t (Japan Mining Industry Association, 2015, p. 11; Japan Oil, Gas and Metals National Corp., 2015b).

In 2014, Japan's total supply of refined lead was 260,228 t. Domestically produced primary lead from imported ore accounted for 34% of the total supply. Another 27% of the lead supply was produced from imported scrap, 17% was produced from other unspecified sources, 12% was accounted for by stocks that were available at the beginning of the year, and 10% was accounted for by imports of refined lead. The total supply of refined lead exceeded total demand each year from 2011 through 2014 by between 3,000 t (2011) and 37,000 t (2014). In 2014, Japan's total consumption of refined lead was 222,948 t, 85.7% of which was consumed in the production of batteries; 4.8%, lead pipes and sheets; 2.2%, the chemical industry; and 0.5%, solder. The remainder was consumed in other unspecified processes (Japan Mining Industry Association, 2015, p. 11; Japan Oil, Gas and Metals National Corp., 2015b).

Zinc.—Production of zinc metal from domestic ore had not contributed to Japan's supply of refined zinc since 2008 when the last reported production amount of domestic ore was 6,800 t. The average tonnage of Japan's annual zinc metal production from 2004 through 2014 (including that produced from domestic and (or) imported ore, scrap, and other unclassified materials) was 591,000 t with a maximum production volume in 2005 of 638,400 t and a minimum in 2009 of 540,600 t (Japan Oil, Gas and Metals National Corp., 2014d; Japan Mining Industry Association, 2015, p. 12).

In 2014, Japan's total supply of refined zinc was 677,593 t. Domestically produced primary zinc metal from imported ore accounted for 67.7% of the total supply. Another 16.8% of the supply was produced from imported scrap, 10.2% was accounted for by stocks at the beginning of the year, 3.8% was accounted for by imports of refined lead, and the remainder was from other unclassified materials. Total supply of refined lead exceeded total demand each year from at least 2004 through 2014 by between 54,000 t (2007) and 207,500 t (2014). In 2014, Japan's total consumption of refined zinc was 470,121 t, 40.6% of which was consumed in the production of galvanized sheets and 13.4% of which was consumed in other galvanizing processes. Another 10.8% was consumed in the production of brass; 8.4%, in diecasting processes; 6.5%, by the chemical industry; 2.4%, in other unspecified processes, and 0.4%, in the production of rolled zinc. The remainder was exported (table 3; Japan Oil, Gas and Metals National Corp., 2014d; Japan Mining Industry Association, 2015, p. 12).

Mineral Fuels and Related Materials

Petroleum and Petroleum Refinery Products.—Japan is the world's leading liquefied natural gas (LNG) importing country and the third leading net importer of crude petroleum and refinery products. It is the third leading petroleum consumer in the world after the United States and China. Petroleum refinery capacity and throughput in Japan decreased almost every year since at least 2003. In 2014, the value of Japan's crude petroleum imports accounted for 16.2% of imported goods. Imports of LNG accounted for 9.1% of the total, petroleum refinery products and petroleum ether combined accounted for 5.5%, and imports of liquefied petroleum gas accounted for 1.3% of the value of imported goods (BP p.l.c., 2015, p. 16).

Outlook

To maintain its position as a globally competitive mineral processing nation, Japan plans to continue to secure and diversify its long-term supply of raw material through foreign direct investment (FDI), particularly in the Western Hemisphere, Oceania, and increasingly in Africa. The value of Japan's outward FDI in mining increased in most years from 2005 through 2013 (the latest year for which calendar year data were available), during which time FDI in mining accounted for between 8% and 17% of the total outward FDI, and it is expected to increase at least modestly through 2017 in line with projected increases in the country's GDP. Japan maintains its long-term supply of metals, petroleum, and liquefied petroleum gas through Government-owned, domestically stored stockpiles; through exploration and development both domestically and internationally, and increasingly through recycling of domestic metal waste (World Bank, The, 2015; Japan External Trade Organization, 2015b).

Beginning in 2017, the Government of Japan plans to conduct deep-sea test mining of minerals at the Izena sea hole, which is located about 100 kilometers northwest of Okinawa Island at a depth of 1,600 meters. Test mining at the site in 2012 led to the discovery of confirmed mineral deposits containing gold, silver, and zinc. Mineral deposits were also found offshore of Kumejima Island near Okinawa and Hachijojima Island near Tokyo. The Government expects to mine about 100 metric tons per day of earth materials for 2 to 4 weeks at the Izena location (Papua New Guinea Mine Watch, 2015).

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TABLE 1
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2010	2011	2012	2013	2014
METALS						
Aluminum:						
Metal:						
Primary		48,820 [r]	43,324 [r]	25,774 [r]	29,070 [r]	45,853
Secondary[3]		128,278 [r]	141,789 [r]	137,304 [r]	143,281 [r]	142,512
Powder	kilograms	13,041	12,882	10,785	11,409	11,783
Antimony:						
Oxide		6,661 [r]	4,965 [r]	4,634 [r]	4,498 [r]	4,500 [e]
Metal		304	435	143	139	94
Cadmium, refined		2,053	1,755	1,855	1,826	1,829
Cobalt, metal		1,935	2,007	2,542	2,747	3,654
Copper, metal:						
Blister and anode:						
Primary		1,382,655	1,168,284	1,304,916	1,249,332	1,290,640
Secondary		260,245	269,748	303,900	313,636	310,029
Total		1,642,900	1,438,032	1,608,816	1,562,968	1,600,669
Refined:						
Primary		1,333,787	1,094,999	1,270,914	1,210,242 [r]	1,108,626
Secondary		214,901	233,289	245,440	257,900	257,583
Total		1,548,688	1,328,288	1,516,354	1,468,142	1,366,209
Gold:						
Mine output, Au content	kilograms	8,544	7,922	7,233	7,411	7,115
Metal:						
Primary	do.	98,398	95,549	74,735	63,070	64,810
Secondary	do.	37,413	36,288	29,544	30,699	30,390
Total	do.	135,811	131,837	104,279	93,769	95,200
Iron and steel, metal:						
Pig iron	thousand metric tons	82,283	81,028	81,405	83,849	83,872
Electric-furnace ferroalloys:						
Ferrochrome		16,208	17,217	19,392	21,671	22,000 [e]
Ferromanganese		453,265	456,798	436,171	460,936	463,345
Ferronickel		348,420	279,944	371,913	402,768	379,291
Silicomanganese		49,865	49,798	52,287	24,741	40,000 [e]
Ferromolybdenum		4,615	5,167	4,616	4,550	4,500 [e]
Ferrovanadium		4,190	3,980	4,403	4,433	4,400 [e]
Unspecified		16,374	20,913	19,364	19,394	19,300 [e]
Total		892,937	833,817	908,416	938,493	932,836
Steel, crude	thousand metric tons	109,599	107,601	107,232	110,595	110,666
Semimanufactures, hot-rolled:						
Ordinary steels	do.	75,000 [e, r]	74,492 [r]	74,911 [r]	77,006 [r]	76,968 [r]
Special steels	do.	20,000 [e, r]	20,340 [r]	19,896 [r]	19,960 [r]	20,914 [r]
Lead, metal, refined:						
Primary		101,610	100,058	91,037	92,227	97,303
Secondary		114,218 [r]	114,986 [r]	117,957 [r]	115,888 [r]	115,370
Total		215,828 [r]	215,044 [r]	208,994 [r]	208,115	212,673
Molybdenum, metal		1,154	1,234	1,013	1,000 [e]	1,000 [e]
Nickel metal:						
Refined		40,228	41,290	41,944	46,405	56,129
Ni content of nickel oxide sinter		59,011	50,437	52,000 [e]	53,000 [e]	53,000 [e]
Ni content of ferronickel		64,349	62,773	73,248	80,554	80,000 [e]
Ni content of chemical		2,497	2,383	2,362	2,500 [e]	2,500 [e]
Total[e]		166,000	157,000	170,000	182,000	192,000
Platinum-group metals:						
Palladium, metal	kilograms	6,107	7,534	8,052	6,239	6,969
Platinum, metal	do.	1,331	1,765	1,735	1,963	1,724

See footnotes at end of table.

TABLE 1—Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2010	2011	2012	2013	2014
METALS—Continued						
Silicon, multicrystalline		11,500 r, e	12,133	10,964	8,000 r	7,263
Silver:						
Mine output, Ag content	kilograms	1,200 e	4,486	3,577	3,644	3,541
Metal:						
Primary	do.	1,898,208	1,724,218	1,764,533	1,731,478	1,791,816
Secondary	do.	313,931	325,373	348,620	346,296	227,983
Total	do.	2,212,139	2,049,591	2,113,153	2,077,774	2,019,799
Tin, metal, smelter		841	947	1,133	1,786	1,746
Titanium, dioxide		207,561	214,417	185,320	173,904	170,000 e
Tungsten, metal		3,361	3,299	3,025	3,000 e	3,000
Zinc:						
Oxide		72,000 e	66,325	58,896	57,840	58,000 e
Metal:						
Primary		470,057	444,446	459,322	470,573 r	458,481
Secondary		103,951	100,228	111,990	117,606 r	124,540
Total		574,008 r	544,674 r	571,312 r	588,031 r	583,021
INDUSTRIAL MINERALS						
Cement:						
Ordinary portland cement	thousand metric tons	35,000 e	35,593	37,657	39,335	40,022
Portland blast furnace cement	do.	11,000 e	11,290	12,164	13,493	12,410
Other cement	do.	900 e	961	1,032	1,088	1,415
Total	do.	46,900 e	47,844 r	50,853 r	53,916 r	53,847
Clinker		48,000 e	47,730	49,969	51,585	52,169
Gypsum	thousand metric tons	4,868 r	4,770 r	5,002 r	4,771 r	4,674
Iodine		9,216	9,277	9,315	9,334	9,814
Lime:						
Quicklime	thousand metric tons	8,547	8,005	7,581	7,619	7,911
Slaked lime	do.	1,400 e	1,420	1,370	1,434	1,401
Nitrogen, N content of ammonia	do.	968 r	995 r	867 r	828 r	787
Salt (unspecified)	thousand metric tons	1,138 r	1,153 r	1,077 r	1,052 r	1,000 e
Silica:						
Sand	do.	3,078	3,003	2,877	2,856	2,932
Stone, quartzite	do.	9,159	9,543	9,306	9,290	9,496
Soda ash		359,000 r	373,000 r	344,000 r	361,000 r	350,000
Stone, crushed:						
Dolomite	thousand metric tons	3,438	3,492	3,361	3,493	3,446
Limestone	do.	133,974	134,176	140,038	148,066	148,008
Sulfur, byproduct of petroleum	do.	1,892	1,755	1,747	1,779	1,751
MINERAL FUELS AND RELATED MATERIALS						
Asphalt	thousand metric tons	4,528	3,997	4,088	3,637	3,428
Carbon black	do.	653 r	681	638	609 r	600 e
Coal, bituminous[e]	do.	1,000	1,270 r	1,320 r	1,200	1,200
Coke, metallurgical	do.	37,447	35,379	34,743	35,154	34,163
Coke, from petroleum refinery		1,114	1,252	964	979	1,099
Gas, natural, gross	million cubic meters	3,396	3,298	3,276	2,995	2,882
Petroleum:						
Crude	42-gallon barrels	5,491,000	5,235,000	4,994,000 r	4,322,000 r	4,051,000
Refinery products:						
Gasoline	thousand 42-gallon barrels	370,013 r	345,056 r	337,578 r	341,720 r	336,757
Naphtha	do.	130,779 r	118,884 r	119,039 r	128,706	114,473
Distillate fuel oil	do.	251,470 r	249,904 r	272,907 r	237,207	218,212
Jet fuel	do.	88,359 r	81,198 r	83,154 r	92,518	96,095
Kerosene	do.	123,751 r	122,032 r	118,114 r	113,551	105,865

See footnotes at end of table.

TABLE 1—Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2010	2011	2012	2013	2014
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued:						
Refinery products—Continued:						
Gas oil	thousand 42-gallon barrels	269,620	253,696	242,735	266,666	257,738
Fuel oil A	do.	102,824	97,328	95,767	90,647	85,414
Fuel oil B and C	do.	148,646	152,577	177,140	146,560	132,868
Liquefied petroleum gas	do.	28,340 [r]	26,489 [r]	26,191 [r]	28,536	27,485
Lubricants	do.	15,960 [r]	16,216 [r]	14,966 [r]	15,173	15,380
Paraffin, wax	do.	501 [r]	500 [r]	423 [r]	440	382
Total	do.	1,530,263	1,463,880	1,488,014	1,461,724	1,390,669

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto.

[1] Table includes data available through July 22, 2015.

[2] In addition to the commodities listed, alumina, aluminum hydroxide, arsenic, bismuth, bromine, chromium, clays, gallium, germanium, manganese, pyrophyllite, rare-earth oxides, selenium, tantalum, tellurium, and vanadium as a byproduct of metallurgy were produced, but available information is inadequate to make reliable estimates of output.

[3] Unalloyed ingot.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	metric tons	Nippon Light Metal Holdings Co., Ltd.	Shizuoka, Shizuoka Prefecture	7,000
Cement		Aso Cement Co., Ltd.	Tagawa and Kanda, Fukuoka Prefecture	2,400
Do.		Daiichi Cement Co., Ltd.	Kawasaki, Kanagawa Prefecture	1,169
Do.		Denki Kagaku K.K.	Omi, Niigata Prefecture	2,762
Do.		Hachinohe Cement Co., Ltd.	Hachinohe, Aomori Prefecture	1,533
Do.		Hitachi Cement Co., Ltd.	Hitachi, Ibaraki Prefecture	941
Do.		Mitsubishi Materials Corp.	Higashidori, Shimokita-gun, Aomori Prefecture; Higashiyama, Higashiiwai-gun, Iwate Prefecture; Yokoze, Saitama Prefecture; Kurosaki, Kyushu, and Higashitani, Fukuoka Prefecture	13,467
Do.		Mitsui Mining Co. Ltd.	Togawa, Fukuoka Prefecture	2,075
Do.		Myojo Cement Co., Ltd.	Itoigawa, Niigata Prefecture	2,482
Do.		Nippon Steel Chemical Co., Ltd.	Tobata, Kitakyushu, Fukuoka Prefecture	855
Do.		Nittetsu Cement Co., Ltd.	Muroran, Hokkaido Prefecture	1,589
Do.		Sumitomo Osaka Cement Co. Ltd.	Tamura, Fukushima Prefecture; Aso, Tochigi Prefecture; Motosu, Gifu Prefecture; Sakata, Shiga Prefecture; Ako, Hyogo Prefecture; and Susaki, Kochi Prefecture	14,402
Do.		Taiheiyo Cement Corp.	Ofunato, Iwate Prefecture; Kumagaya and Saitama, Saitama Prefecture; Fujiwara, Mie Prefecture; Tsukumi, Oita Prefecture; and Kamiiso, Hokkaido Prefecture	28,800
Do.		Tokuyama Cement Co. Ltd.	Nanyo, Yamaguchi Prefecture	5,936
Do.		Tosoh Corp.	Shin Nanyo, Yamaguchi Prefecture	2,869
Do.		Tsuruga Cement Co. Ltd.	Tsuruga, Fukui Prefecture	1,710
Do.		Ube Industries Ltd.	Ube and Isa, Yamaguchi Prefecture, and Kanda, Fukuoka Prefecture	10,736
Cobalt, refined	metric tons	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	1,000
Copper, refined	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	225,600
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Mitsubishi Materials Corp., 50.45%; Dowa Mining Co. Ltd., 32.13%; Furukawa Co. Ltd., 7.98%; Furukawa Electric Co. Ltd. and Mitsubishi Cable Industries Ltd., 4.29% each; others, 0.85%)	Onahama, Fukushima Prefecture	250,000
Do.	do.	Pan Pacific Copper Co., Ltd. (JX Nippon Mining & Metals Co., Ltd., 66%, and Mitsui Mining and Smelting Co., Ltd., 34%)	Saganoseki, Oita Prefecture; Hitachi, Ibaraki Prefecture; and Tamano, Okayama Prefecture	710,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	72,000
Gold:				
In concentrate	kilograms	Sumitomo Metal Mining Co. Ltd. (SMM)	Hishikari, Kagoshima Prefecture	9,000
Refined	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	24,000
Do.	do.	Mitsui Mining and Smelting Co., Ltd.	Takehara, Hiroshima Prefecture	22,000
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	60,000
Do.	do.	JX Nippon Mining & Metals Co., Ltd.	Hitachi, Ibaraki Prefecture	30,000
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	36,000
Indium, metal		Dowa Metals and Mining Co.	Iijima, Akita Prefecture	NA
Do.		Mitsui Mining and Smelting Co.	Takehara, Hiroshima Prefecture	NA
Do.		Sumitomo Mining Co.	Harima, Hyogo Prefecture	NA
Do.		JX Nippon Mining Metals Co.	Isohara, Ibaraki Prefecture	NA
Do.		Materials Eco-Refining Co.	Onahama, Fukushima Prefecture	NA
Do.		Nippon Rare Metal Inc.	Yokohama, Kanagawa Prefecture	NA
Do.		Shinko Chemical Co.	Amagasaki, Hyogo Prefecture	NA
Do.		Kisan Kinzoku Chemicals Co.	Oosaka, Oosaka Prefecture	NA

See footnotes at end of table.

TABLE 2—Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iodine, crude	metric tons	Ise Chemical Industries Co. Ltd. (Asahi Glass Co. Ltd., 52.4%, and Mitsubishi Corp., 11.2%)	Oami-Shirasato and Ichinomya, Chiba Prefecture; and Sadowara, Miyazaki Prefecture	3,600
Do.	do.	Godo Shigen Sangyo Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 11%, and Mitsui & Co. Ltd., 10%)	Chosei, Chiba Prefecture	2,400
Do.	do.	Kanto Natural Gas Development Co. Ltd. (Mitsui Chemicals, Inc., 21.9%, and Godo Shigen Sangyo Co. Ltd., 14.3%)	Mobara, Chiba Prefecture	1,200
Do.	do.	Nihon Tennen Gas Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 50%, and Tomen Corp., 41%)	Shirako and Yokoshiba, Chiba Prefecture	1,200
Do.	do.	Toho Earthtech, Inc. (Itochi Corp., 34.1%; Mitsubishi Gas Chemical Co. Ltd., 32.2%; Nippon Light Metal Co. Ltd., 31.1%)	Kurosaki, Niigata Prefecture	720
Do.	do.	Nippon Chemicals Co. Ltd. (Nippon Shokubai Co. Ltd., 17%; Takeda Chemical Industries Ltd., 16.4%; Chugai Boyeki Co. Ltd., 13.6%)	Isumi, Chiba Prefecture	720
Lead, refined	do.	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	33,600
Do.	do.	Mitsui Mining and Smelting Co., Ltd.	Takehara, Hiroshima Prefecture	43,800
Do.	do.	Toho Zinc Co. Ltd.	Chigirishima, Hiroshima Prefecture	120,000
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Harima, Hyogo Prefecture	30,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd.	Kosaka, Akita Prefecture	25,200
Do.	do.	Hosokura Smelting and Refining Mining Co. Ltd. (wholly owned subsidiary of Mitsubishi Materials Corp.)	Hosokura, Miyagi Prefecture	22,200
Limestone		Mitsubishi Materials Corp.	Higashitani, Fukuoka Prefecture	10,000
Do.		Nittetsu Mining Co., Ltd.	Torigatayama, Kochi Prefecture; Oita, Oita Prefecture; and Shiriya, Aomori Prefecture	23,000
Do.		Sumikin Mining Co., Ltd.	Hachinohe Sekkai, Aomori Prefecture	5,500
Do.		Sumitomo-Osaka Cement Co. Ltd.	Ibuku, Shiga Prefecture, and Karazawa, Tochigi Prefecture	4,000
Do.		Shuho Mining Co., Ltd.	Sumitomo Cement Shuho, Yamaguchi Prefecture	8,200
Do.		Taiheiyo Cement Co. Ltd.	Ofunato, Iwate Prefecture; Ganji and Tsukumi, Oita Prefecture; Garo, Hokkaido Prefecture; Kawara, Fukuoka Prefecture; Tosayama, Kochi Prefecture; Taiheiyo Buko, Saitama Prefecture; and Shigeyasu, Yamaguchi Prefecture	46,000
Do.		Todaka Mining Co. Ltd.	Todaka-Tsukumi, Otia Prefecture	12,000
Do.		Ube Kosan Co. Ltd.	Ube Isa, Yamaguchi Prefecture	9,000
Manganese, electrolytic dioxide		Mitsui Mining and Smelting Co., Ltd.	Takehara, Hiroshima Prefecture	24
Do.		Tosoh Corp.	Hyuga, Miyazaki Prefecture	34
Nickel:				
In ferronickel	metric tons	Hyuga Smelting Co. Ltd. [wholly owned subsidiary of Sumitomo Metal Mining Co. Ltd. (SMM)]	do.	22,000
Do.	do.	Yakin Oheyama Co. Ltd.	Oheyama, Kyoto Prefecture	12,720
Do.	do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	40,800
In oxide	do.	Tokyo Nickel Co. Ltd.	Matsuzaka, Mie Prefecture	60,000
Refined	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

TABLE 2—Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum, refinery	million 42-gallon barrels	JX Nippon Oil & Energy Corp.	Mizushima, Marifu, Nishihara, Oita, Osaka, and Negishi refineries	465
Do.	do.	Cosmo Oil Co. Ltd.	Chiba, Sakai, and Yokkaichi refineries	165
Do.	do.	Idemitsu Kosan Co., Ltd.	Aichi, Chiba, and Idemitsu refineries	195
Do.	do.	Taiyo Oil Co. Ltd.	Shikoku refinery	43
Do.	do.	Showa Yokkaichi Sekiyu Co., Ltd.	Yokkaichi refinery	93
Do.	do.	TonenGeneral Sekiyu K.K.	Kawasaki, Sakai, and Wakayama refineries	199
Do.	do.	Toa Oil Co. Ltd.	Keihin refinery	26
Do.	do.	Fuji Oil Co. Ltd.	Sodegaura refinery	52
Do.	do.	Kyokuto Sekiyu Co. Ltd.	Chiba refinery	55
Do.	do.	Kashima Oil Co. Ltd.	Kashima refinery	92
Do.	do.	Seibu Oil Co. Ltd	Yamaguchi refinery	44
Pyrophyllite		Ohira Kozan Co. Ltd.	Ohira, Okayama Prefecture	132
Do.		Shinagawa Shirenga Co. Ltd.	Mitsuishi, Okayama Prefecture	180
Do.		Shokozan Kogyosho Co. Ltd.	Yano-Shokozan, Hiroshima Prefecture	180
Steel, crude		JFE Steel Corp. (wholly owned subsidiary of JFE Holdings Inc.)	Chiba, Chiba Prefecture; Kawasaki (Keihin), Kanagawa Prefecture; Nishinomiya, Hyogo Prefecture; Handa, Aichi Prefecture; Fukuyama, Hiroshima Prefecture; and Kurashiki, Okayama Prefecture	33,835
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture	8,943
Do.		Nippon Steel & Sumitomo Metal Corp.	Oita, Oita Prefecture; Kawata, Fukuoka Prefecture; Kimitsu, Chiba Prefecture; and Nagoya, Aichi Prefecture	33,199
Do.		do.	Kashima, Ibaraki Prefecture; Kokura, Fukuoka Prefecture; and Wakayama, Wakayama Prefecture	12,820
Do.		Nisshin Steel Co. Ltd.	Kuri, Hiroshima Prefecture; Osaka City; Shunan, Yamaguchi Prefecture; and Toyo, Ehime Prefecture	4,000
Tantalum	metric tons	Japan New Metals Co. Ltd.	Akita, Akita Prefecture	95
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Miyama, Fukuoka Prefecture	NA
Titanium:				
In sponge metal		Sumitomo Titanium Corp. (Sumitomo Metal Industries, Ltd., 75.2%, and Kobe Steel Ltd., 24.8%)	Amagasaki, Hyogo Prefecture	24
Do.		Toho Titanium Co. Ltd. (JX Nippon Mining & Metals Co., Ltd., 47%; Mitsui & Co. Ltd., 20%; others, 33%)	Chigasaki, Kanagawa Prefecture	15
In dioxide	metric tons	Fuji Titanium Industry Co. Ltd. (Ishihara Sangyo Kaishia Ltd., 24.8%, and others, 75.2%)	Kobe, Hyogo Prefecture	17,400
Do.	do.	Ishihara Sangyo Kaisha Ltd.	Yokkaichi, Mie Prefecture	154,800
Do.	do.	Sakai Chemical Industries Co. Ltd.	Onahama, Fukushima Prefecture	60,000
Do.	do.	Tayca Corp.	Saidaiji, Okayama Prefecture	60,000
Do.	do.	Titan Kogyo Kabushiki Kaisha	Ube, Yamaguchi Prefecture	16,800
Zinc, refined	do.	Akita Smelting Co. Ltd. [Dowa Mining Co. Ltd., 57%; JX Nippon Mining & Metals Co., Ltd., 24%; Sumitomo Metal Mining Co. Ltd. (SMM), 14%; Mitsubushi Materials Corp., 5%]	Iijima, Akita Prefecture	200,400
Do.	do.	Hachinohe Smelting Co. Ltd. (Mitsui Mining and Smelting Co. Ltd., 57.7%; JX Nippon Mining & Metals Co., Ltd., 27.8%; Toho Zinc Co. Ltd. and Nisso Smelting Co. Ltd., 14.5%)	Hachinohe, Aomori Prefecture	117,600
Do.	do.	Hikoshima Smelting Co. Ltd.	Hikoshima, Yamaguchi Prefecture	84,000
Do.	do.	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	72,000
Do.	do.	Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139,200
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Harima, Hyogo Prefecture	90,000

Do., do. Ditto. NA Not available.

TABLE 3
JAPAN: SUPPLY AND DEMAND FOR SELECTED NONFERROUS METALS

(Metric tons unless otherwise specified)

	Refined copper			Refined lead		
	2012	2013	2014	2012	2013	2014
Stocks at the beginning of the year	124,578	145,938	86,805	15,168	19,558	30,708
Production	1,516,354	1,468,142	1,554,224	208,994	208,115	212,673
Imports	35,876	41,426	68,804	28,869	23,883	26,907
Total supply	1,676,808	1,655,506	1,709,833	253,031	251,556	270,288
Exports	545,908	572,140	505,950	20,708 r	8,621	5,708
Reported consumption	948,687 r	911,601	974,591	204,908 r	209,488	217,240
Total demand	1,494,595 r	1,483,741	1,480,541	225,616 r	218,109	222,948
Stocks at the end	145,938 r	103,379	131,497	19,558 r	30,708	35,086
Apparent consumption	984,962	979,987	1,072,386	212,765 r	212,227	219,494
	Refined zinc			Silver (kilograms)		
	2012	2013	2014	2012	2013	2014
Stocks at the beginning of the year	92,265	72,891	68,932	999,120	1,037,918	964,069
Production	571,312	587,291	583,021	1,764,533	1,731,478	1,791,816
Remelting	NA	NA	NA	348,620	267,977	227,983
Imports	23,960	21,816	25,640	1,698,639	1,778,354	1,693,036
Total supply	687,537	681,998	677,593	4,810,912	4,815,727	4,676,904
Exports	135,560	115,383	82,206	3,493,979 r	3,601,010	3,740,987
Reported consumption	356,811 r	383,614	387,915	1,089,298 r	1,048,790	1,044,530
Total demand	492,371 r	499,007	470,121	4,583,277 r	4,649,800	4,785,517
Stocks at the end	72,891 r	68,932	97,907	1,037,918	964,059	908,614
Apparent consumption	479,086 r	497,683	503,480	279,015 r	250,658	27,303

[r] Revised. NA Not applicable.

Source: Japan Mining Industry Association, 2015.

TABLE 4
JAPAN: RESERVES OF MAJOR MINERAL COMMODITIES IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Exploitable reserves
Coal[1]		347,000 r
Dolomite		900,000 r, e
Gold ore, Au content[2]	kilograms	150,000 r
Iodine		5,000 e
Limestone		40,000,000 r, e
Pyrophyllite		60,000 r, e
Silica sand		74,000 r, e
Silica stone, white		450,000 r, e

[e] Estimated. [r] Revised.

[1] Proved reserves of anthracite, bituminous, lignite, and subbituminous.

[2] Proven and probable reserves at Hishikari gold mine as of 2012. (Source: Sumitomo Metal Mining Co., Ltd., 2012, 30th Anniverary of Hishikari Mine and achievement of cumulative production of 200 tons of gold: Tokyo, Japan, Sumitomo Metal Mining Co., Ltd., November 12, 1 p.

THE MINERAL INDUSTRY OF NORTH KOREA

By Susan Wacaster

According to estimates by the Bank of Korea, which is the central bank of the Republic of Korea, the rate of growth of North Korea's real gross domestic product (GDP) increased by 1.0% in 2014 compared with that of 2013. The Bank of Korea has estimated information about the economy of North Korea in terms of real and nominal GDP since 1991 by compiling production data supplied by unspecified relevant institutions and by using the international System of National Accounts to develop GDP estimates.[1] The year-on-year real GDP rate of growth was estimated to have increased by 3.8% in both 2001 and 2005, which were the years with the highest rates of growth since 1990; the average annual rate of growth for 1990 to 2014 was less than 1%. Real GDP in 2014[2] was estimated to be about \$30 billion compared with \$28 billion in 2013, and the nominal GDP was estimated to be about \$31 billion compared with \$32 billion in 2013. The nominal gross national income of North Korea was estimated to be about \$33 billion in 2014 compared with \$31 billion in 2013 (Bank of Korea, 2015, p. 1, 4).

Bilateral trade with China as well as foreign aid and direct investment from China have been critical for productivity in North Korea. From 2003 to 2009, China's investments in North Korea amounted to about \$98 million.[3] Nonetheless, because of limitations on development resulting from international sanctions on North Korea, the country's outdated infrastructure, and the way that resources are allocated in the country, China's investments in North Korea accounted for just 3% of the total foreign investment that China directed to other countries of the region (including Burma, North Korea, the Republic of Korea, Mongolia, Thailand, and Vietnam) during the same period of time. Of the 138 China and North Korea joint-venture agreements established from 1997 to 2010, 41% were in extractives industries, 38% were in light industries, 13% were in services (unspecified), and 8% were in heavy industries (Thompson, 2011, p. 3, 4).

Minerals in the National Economy

The mining and manufacturing sectors combined were estimated to have accounted for 34.4% of the country's nominal GDP in 2014. The mining sector accounted for 13.1% of the nominal GDP in 2014 compared with 13.6% in 2013 and 14.0% in 2012. The value of mining output in 2014 based on real GDP estimates increased by 1.6% to about \$4 billion compared with that of 2013. The year-on-year rate of change in the value of heavy industrial and chemical manufacturing, which included the fabrication of metal products, decreased by 5.6% in 2014 compared with that of 2013 (Bank of Korea, 2015, p. 3, 6).

Production

North Korea was known to have coal, copper, gold, graphite, iron ore, lead, limestone, magnesite, salt, tungsten, and zinc resources. Production of processed minerals in the past included cadmium, cement, coke, refined copper, ferroalloys, refined lead, nitrogen fertilizer materials, pig iron, crude steel, and refined zinc (table 1). Reported estimates of North Korea's total production capacity of nonferrous metals, which was given only for lead and zinc (unspecified as to product form), was about 400,000 metric tons (t) in 2013 (the most recent year for which data were available). Of that amount, 77% of nonferrous metal production capacity was accounted for by zinc, and the rest was accounted for by lead. Mine production rates in North Korea, however, were low compared with the estimated installed capacities. In 2006, the Musan iron ore mine was reported to be operating at about 30% of capacity and, as of 2007, the Daeheung magnesite mine was reported to be operating at 60% of capacity. As of 2011, it was thought that most mine facilities were operating at production rates of less than 30% of capacity owing in part to deteriorating infrastructure and a marginally operating electrical grid (Kyung-soo, 2011; Statistics Korea, 2014, p. 76).

Structure of the Mineral Industry

North Korea's mineral industry included a coal-mining sector, a ferrous and nonferrous metals sector, an industrial minerals sector, and petroleum refining capacity. Mining and mineral enterprises in North Korea were primarily owned and operated by the Central Government. Companies from China, the Republic of Korea, and other countries had participated in joint ventures with North Korea for the development and operation of mineral facilities. As of 2011, about 25 mining projects in North Korea were joint ventures with foreign investors. In 2012 (the most recent year for which data were available), the country had an estimated total of 696 mines, of which 240 were coal mines, 234 were metal mines, and 222 were nonmetal mines (table 2; Statistics Korea, 2014, p. 69).

Mineral Trade

The reported value of North Korea's total trade (exports plus imports, excluding trade between North Korea and the Republic of Korea) increased by 3.6% in 2014 to \$7.6 billion compared with that of 2013. From 1995 through 2007, the total value of trade had fluctuated but increased overall, and included a low of \$1.4 billion in 1998 (when it decreased by 33.7% compared with that of 1997) and a high of \$3.8 billion in 2008; the overall increase during this period indicates that the economy of

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[1] Estimates by the Bank of Korea were based on prices and value-added ratios for the Republic of Korea. Where necessary, values have been converted from Republic of Korea won (KRW) to U.S. dollars (US\$) at an average rate of KRW\$1,052=US\$1.00 in 2014 and KRW\$1,094=US\$1.00 for 2013.

[2] When values for gross domestic product and gross national income are converted from KRW to US\$, the rate of growth between years becomes skewed. Values have been rounded to the nearest billion.

[3] All data for trade were reported in U.S. dollars.

North Korea benefited from increased global prices for mineral commodities in the mid-2000s. Thereafter, with the exception of a slight decrease in 2009 to $3.4 billion (when total trade decreased by 10.5% compared with that of 2008), the total value of trade continued to increase through 2014. The decreases in North Korea's total trade value in 1998 and 2009 indicate that the country's economy was affected by the global recessions of 1998 and 2008 to 2009 (prior to 2009, the International Monetary Fund classified global annual GDP growth rate of 3.0% or less as a global recession) (Bank of Korea, 2015, p. 4; Statistics Korea, 2014, p. 78).

The value of North Korea's exports decreased by 1.7% to $3.2 billion in 2014 compared with that of 2013 and exports of mineral origin decreased by 17.1%. The value of imports to North Korea in 2014 increased by 7.8% to $4.5 billion, and imports of machinery increased by 27%. From 2009 through 2013 (the most recent years for which data were available), China accounted for about 80% to 90% of total trade with North Korea, excluding trade between North Korea and the Republic of Korea (Statistics Korea, 2014, p. 84, 93).

The value of bilateral trade between North Korea and the Republic of Korea increased by 106.2% in 2014 to $2.3 billion. The value of trade between North Korea and Republic of Korea had generally trended upward since the mid-1990s until it decreased significantly in 2013, which may have resulted from diplomatic strains between the two countries. The increase in bilateral trade in 2014 was attributed to expanded trading of electronics and textiles (Bank of Korea, 2015, p. 4–5).

Commodity Review

Metals

Iron Ore.—The Musan iron ore mine, which had been operating intermittently owing to power shortages, ceased production completely at the end of 2014 for at least 2 months. About 40% of the mine's workforce, which reportedly earned less than $4.00 per day, was expected to be laid off. North Korea reportedly rejected a request from China to lower the price of its iron ore shipments to $50 per metric ton, resulting in reduced exports to China in 2014 (Min, 2015).

Lead and Zinc.—According to the United Nations Commodity Trade Statistics database, North Korea exported about 106,000 t of lead ore and concentrate valued at about $56.4 million and about 19,000 t of zinc ore and concentrate valued at about $7 million in 2014. All the exported lead and zinc was reported to have been received by China (United Nations Statistics Division, 2015).

Mineral Fuels and Related Materials

Coal.—Russia and North Korea had conducted negotiations over a production-sharing agreement that would result in exports of metallurgical coal from North Korea in return for a $25 billion 20-year investment into the North Korea railway network. The railway renovation commenced in October 2014. The railway runs between coalfields in the South Pyongan Province and the country's west coast at Nampo. Mining would reportedly take place simultaneously as improvements were made to the railway. From 1995 through 2013 (the most recent years for which data were available), coal had accounted for a steadily increasing share of North Korea's total primary energy production (49% in 2013 compared with 69% in 1995) (Yonho, 2014; Statistics Korea, 2014, p. 112).

Refinery Products.—North Korea was known to have two oil refineries. The country had reportedly been operating only one of the refineries, which was located at the Ponghwa chemical factory, since the Sungni chemical plant in Sonbong was shut down in 1995. The Ponghwa site is also the location of the Chongchon-gang thermoelectric powerplant, which was constructed in the mid-1970s with assistance from China, the Friendship Oil Pipeline that linked the refinery to petroleum products storage facilities in China's Dandong region, and a petrochemical research institution. The former Soviet Union built the Sungni plant in the early 1970s and supplied the country with crude petroleum until North Korea could not make market value cash payments; the Sungni chemical plant ultimately closed in 1995 (Bermudez, 2015).

Outlook

The mining sector in North Korea is not directly subject to international economic sanctions and is, therefore, the only legal, lucrative source of investment trade available to the country. Improvements to the country's mineral sector in the near- to mid-term seem more likely than in the recent past, but international sanctions, political tensions, lack of infrastructure, lack of investment, and a high level of sovereign risk still limit the options that are available to North Korea and any potential foreign investors. The degree to which China will remain a leading source of foreign currency for North Korea may decline as China implements environmental regulations that could decrease its demand for certain grades of coal.

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TABLE 1
NORTH KOREA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity[3,4]		2010	2011	2012	2013	2014
METALS						
Cadmium metal, smelter		200	200	200	200	200
Copper:						
Mine output, Cu content		4,600[r]	7,000[r]	6,700[r]	6,200[r]	14,400
Metal, primary and secondary:						
Smelter		15,000	15,000	15,000	15,000	15,000
Refinery		12,000	12,000	12,000	12,000	12,000
Gold, mine output, Au content	kilograms	2,000	2,000	2,000	2,000	2,000
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand metric tons	5,000[r]	5,000[r]	5,000[r]	5,000[r]	6,000
Fe content	do.	2,500[r]	2,500[r]	2,500[r]	2,500[r]	2,800
Metal:						
Pig iron	do.	250	250	250	250	250
Ferroalloys, unspecified	do.	22	21	25	28	30
Steel, crude	do.	1,200[r]	1,300[r]	1,200[r]	1,200[r]	1,200
Lead:						
Mine output, Pb content		26,000	32,000	38,000	59,000	53,100
Metal, primary and secondary:						
Smelter		9,000	9,000	9,000	9,000	9,000
Refinery		4,000	3,000	3,000	3,000	3,000
Silver, mine output, Ag content		50	50	50	50	50
Tungsten, mine output, W content		110	110	100	65	70
Zinc:						
Mine output, Zn content		29,000[r]	38,000[r]	34,000[r]	35,000[r]	36,000
Metal, primary and secondary		26,000[r]	36,000[r]	30,000[r]	31,000[r]	32,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	6,100[r]	6,300[r]	6,400	6,400	6,600
Graphite		10,000	10,000	10,000	10,000	10,000
Magnesia		250,000	250,000	178,000	180,000	180,000
Nitrogen, N content of ammonia	thousand metric tons	200[r]	200[r]	200[r]	200[r]	200
Phosphorous content of fertilizer		90,000	90,000	90,000	95,000	95,000
MINERAL FUELS AND RELATED MATERIALS						
Coal	thousand metric tons	41,000	41,000	41,500[r]	42,000	41,000
Coke	do.	2,000	2,000	2,000	2,000	2,000

[r] Revised. do. Ditto.

[1] Estimated data are rounded to no more than three significant digits.

[2] Table includes data available through November 25, 2015.

[3] In addition to the commodities listed, crude construction materials, such as salt, sand and gravel, sulfur, stone, and refined petroleum products are produced, but available information is inadequate to make reliable estimates of output.

[4] Because of the lack of official reported data, mineral commodity production numbers have been estimated.

TABLE 2
NORTH KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity^e
Cement		Sunchon Cement Complex	Pyongnam Province	3,000
Do.		Samgwong Cement Complex	Kangwon Province	2,500
Do.		Gomusan Cement Factory	Hambuk Province	2,000
Do.		Cheonnaeri Cement Factory	Hamnam Province	1,000
Coal		Anju Coal Mining Complex and Sunchon Coal Mining Complex	Pyongbuk and Pyongnam Provinces	9,500
Do.		Saebyol Coal Mining Complex and Northern Coal Mine Enterprise	Hambuk Province	6,000
Copper, mine output, Cu content		Hyesan Youth Copper Mine (owned by Wanxiang Industrial Group, 51%, and Huizhong Mineral Industry, 49%)	Yanggang Province	15
Gold, mine output, Au content	kilograms	Kumsan Joint Venture Co.	Hambuk Province	530
Do.	do.	Daebong Mine	Yanggang Province	150
Graphite		Yeongchon Graphite Mine (joint venture of Korea Resources Corp. and the Government of North Korea)	Hwangnam Province	75
Iron ore, concentrate, gross weight		Ministry of Metal and Machinery, Department of Mines, Musan Iron Ore Mine Complex	Hambuk Province	10,000
Do.		Unryul Mine	Hwangnam Province	1,000
Lead:				
In concentrate		Korea Zinc Industrial Group	do.	60
Refined		do.	Kangwon Province	32
Magnesia clinker		Korea Magnesia Clinker Industry Group (KMCIG) and Quintermina AG	Hambuk and Hamnam Provinces	1,200
Magnesite, concentrate, gross weight		Korea Magnesia Clinker Industry Group (KMCIG)	do.	2,500
Steel, crude				
Do.		Kim Chaek Iron and Steel Complex (Ministry of Metal and Machinery)	Hambuk Province	2,400
Do.		Hwanghae (Hwanghai) Iron Works	Hambuk Province	1,500
Do.		Kangson Works	Hwanbuk Province	960
Do.		Chollima Steel Works	Pyongnam Province	760
Zinc:				
In concentrate		Korea Zinc Industrial Group	Hamnam and Hwangnam Provinces	80
Refined		do.	Hamnam and Kangwon Provinces	100

^{e}Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.

THE MINERAL INDUSTRY OF THE REPUBLIC OF KOREA

By Susan Wacaster

The Republic of Korea has reserves of some metallic minerals as well as significant reserves of some industrial minerals, including limestone, silica stone (quartzite), talc, and zeolites. The Republic of Korea, however, has few fossil fuel resources and depends almost entirely on imports to satisfy the country's energy demand. The country's role in the global mineral industry in 2014 was primarily as a consumer of imported raw materials for its globally ranked manufacturing sector and as a provider of foreign direct investment (FDI) to finance joint-venture exploration and mining projects abroad. The Republic of Korea was also active in the construction of industrial facilities, including those for power generation and oil and gas exploration and processing throughout the world, but particularly in Latin America and the Middle East.

The year-on-year rate of growth of the Republic of Korea's real gross domestic product (GDP) in 2014 was 3.3% compared with a revised 2.3% in 2013 and 3.2% in 2012. The modest increase in the GDP in 2014 was owing in part to increased imports and fixed capital formation, particularly in the first quarter. A decrease in prices, production, and domestic demand for mineral commodities and decreased exports to China tempered economic growth. Government and private consumption decreased in 2014, resulting in a 0.2% year-on-year decrease in final consumption compared with that of 2013. The value of the services and manufacturing sectors accounted for 59.4% and 30.3% of the nominal GDP, respectively, and constituted the largest shares of the GDP (Bank of Korea, 2015, p. 1, 18, 21).

Minerals in the National Economy

In 2014, the value of nonfuel mineral production, imports, and domestic demand decreased by 5%, 3%, and 3%, respectively, compared with that of 2013. Mining and quarrying activity accounted for just 0.2% of the GDP, which was the same as in 2013. Production of limestone accounted for 66.8% of the value of mineral production in 2014, followed by silica stone (5.3%), iron ore (2.9%), clays (1.9%), pyrophyllite (1.8%), silica sand (1.5%), feldspar (1.4%), titanium (1.3%), molybdenum (0.7%), and lead (0.6%), the sum of which accounted for 84.2% of the total. Owing to decreased international prices for metallic minerals, the value of imports decreased. The quantity of copper ore and concentrate imports decreased by 6% compared with that of 2013 owing to decreased demand (Bank of Korea, 2015, p. 18, 21; Korea Institute of Geoscience and Mineral Resources, 2015, p. 17, 29).

In 2014, the total value of production of nonfuel minerals and coal decreased by 5% to $1.7 billion,[1] of which coal accounted for 14%. In 2014, the value of nonfuel mineral imports alone decreased by 2.9% to $17.3 billion, and that of coal decreased by 10.9% to $12 billion. The value of stocks of nonfuel minerals at the beginning of 2014 decreased by 12% compared with that of 2013 to $463.2 million, and those of coal remained the same at $11.4 million. In 2014, the value of domestic demand for nonfuel minerals increased by 2.9% to $18 billion compared with that of 2013, and that of coal decreased by 10.7% to $12.2 billion. The value of nonfuel mineral exports increased by 16.5% to $295.2 million, and that of coal increased by 20% to $6 million. At the end of 2014, the value of the remaining stocks of nonfuel minerals decreased by 13.9% to $439 million, and that of coal increased by 33% to $11.4 million (Korea Institute of Geoscience and Mineral Resources, 2015, p. 8).

In 2014, the Republic of Korea had diversified investments in 110 countries and its outward FDI was $24.7 billion. The number of enterprises that were newly established in foreign countries through FDI decreased by 1.5% compared with that of 2013 to 2,768. By value, the three countries that received the most FDI from the Republic of Korea in 2014 were the United States, China (which replaced Australia as second), and Vietnam (which replaced China as third). The United States, China, and Vietnam combined received 39.0% of the total outward FDI; the Republic of Korea's investment in China was the least it had been since 2009.

The Republic of Korea directed the greatest amount of FDI in 2014 ($7.2 billion) towards the manufacturing sector. Of that amount, 35.5% was received by countries in Asia. The second greatest amount, $5.2 billion, was directed towards the mining sector. Oceania was the leading region for FDI in mining, accounting for 28.0% of the total. The Export Import Bank of Korea (Korea Eximbank) provided services to Korean enterprises conducting international business. Korea Eximbank provided financing to Korean and (or) foreign companies with Korean equity shares that conducted exploration for and development and production of natural resources outside the country. In December 2014, Korea Eximbank approved $1.3 billion in loans and guarantees to the Companhia Siderugica do Pecem (CSP) Steel Complex project in Brazil, which was the largest contract value awarded to a single company in the history of Republic of Korea overseas construction. The CSP Steel Complex project was a joint venture among Vale S.A. of Brazil (50%), Dongkuk Steel Mill Co. Ltd. (30%), and POSCO Ltd. (20%). The project, which was projected to cost $4.8 billion to develop, was expected to produce 3 million metric tons per year (Mt/yr) of steel plate for export. Construction at the plant was 56% complete as of February 2015 (Export Import Bank of Korea, 2015, p. 13, 29; Vale S.A., 2015).

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[1] Estimates by the Bank of Korea used Republic of Korea prices and value-added ratios. Where necessary, values have been converted from Republic of Korea won (KRW) to U.S. dollars (US$) at an annual average exchange rate of KRW1,094=US$1.00 for 2013 and KRW1,052=US$1.00 for 2014.

Government Policies and Programs

The Ministry of Trade, Industry, and Energy (MOTIE) is the Government agency responsible for implementing the country's mineral laws and policies. The Korea Mining Act provides the basic guidelines for exploitation of the country's mineral resources. Korea Resources Corp. (KORES) supports development of the domestic private-sector mineral industry, conducts research, and provides technical assistance for the acquisition and development of overseas mineral resources. KORES has foreign investments in 32 mineral projects in 16 countries; the projects include mining for coal in Australia, lithium and rare metals in Africa, and copper in Latin America (Korea Resources Corp., 2015).

The Korea Institute of Geoscience and Mineral Resources (KIGAM) is the entity that developed from the Korean Geological Survey, which was founded in 1918. Divisions within the KIGAM include the Geologic Environment Division, the Geological Research Division, the Mineral Resources Research Division, the Petroleum and Marine Research Division, and the R&D Tech-Biz Division (Korea Institute of Geoscience and Mineral Resources, 2015).

The Republic of Korea had nearly 33 free trade agreements (FTAs) in various stages of completion, ranging from consultation and study (10) to signed and in effect (12). Other agreements were being negotiated (7) or were signed but not yet in effect (4). The Republic of Korea's trade agreement with China, for which negotiations began in 2012, was expected to be signed in 2015. The total value of bilateral trade between the two countries was about $270 billion in 2013, making the Republic of Korea China's sixth-ranked trading partner and third-ranked source of imports. On January 1, 2015, the Canada-Korea Free Trade Agreement (the Agreement) entered into force, marking the first trade agreement established by Canada in the Asia and the Pacific region. As of that date, about 90% of Canada's exports to the Republic of Korea became duty free, and almost all exports were expected to become duty free in the near term. In 2014, Canada accounted for 15.8% of the value of copper imported by the Republic of Korea ($575 million), 3.4% of iron ore ($288 million), and 1.9% of gold ($2.5 million) (Asia Regional Integration Center, 2015; Korea Institute of Geoscience and Mineral Resources, 2015, p. 16).

Production

In 2014, the tonnage of mined minerals and refined metals produced in the Republic of Korea changed little compared with that of 2013. The year-on-year percentage decrease in gold production and the increase in iron content of iron ore were the greatest changes among metals. The quantity of talc produced in 2014 increased by 95% compared with that of 2013, and the amount of diatomaceous earth produced increased by 94% (table 1).

Structure of the Mineral Industry

The Republic of Korea's mining and quarrying sector produced small amounts of coal and ferrous and nonferrous metals and relatively larger amounts of industrial minerals. The mineral-processing sector, which consisted of the cement, ferrous and nonferrous metals, and refined petroleum industries, was, in terms of the value and quantity of output, much larger than the mining and quarrying sector. Most of the mining, quarrying, and ferrous- and nonferrous-metal-processing companies were privately owned and operated and were incorporated in the Republic of Korea. Some larger coal mining, natural gas, petrochemical, and petroleum-refining companies were state owned, including KORES. Both state-operated and privately owned petroleum companies were active in foreign exploration and production projects. Korea National Oil Corp. (KNOC) was involved in oil exploration, development, and production in 21 countries, including oilfields in the North Sea and shale gas fields in North America (table 2; Korea National Oil Corp., 2015).

Mineral Trade

The total year-on-year value of exports from the Republic of Korea increased by 2.3% in 2014 to $572.7 billion. The value of nonfuel mineral and coal exports in 2014 was $300.3 million, which accounted for less than 1% of total trade. The value of raw material exports as a whole decreased by 0.6% compared with that of 2013. In 2014, the total value of imports decreased by 1.9% to $525.5 billion. The value of nonfuel mineral and coal imports decreased by 3% to $29.3 billion. The leading imported raw material product to the Republic of Korea continued to be crude petroleum (accounting for 18.1% of the total value of all imports), followed by chemicals (8.3%), natural gas (7.0%), and iron and steel products (5.1%). In 2014, the rate of growth in the value of natural gas imports increased by 0.7% compared with an increase of 7.3% in 2013 and that of crude petroleum imports decreased by 4.5% compared with an increase of 8.3% in 2013. In 2014, the Republic of Korea imported 99.3% of the metallic minerals and 27.2% of the nonmetallic minerals required to satisfy the country's domestic demand (Bank of Korea, 2014, p. 28–29; Korea Institute of Geoscience and Mineral Resources, 2015, p. 6–8).

In terms of value, Australia, Brazil, and Chile were the leading suppliers of nonfuel minerals to the Republic of Korea in 2014, as they had been in 2012 and 2013, accounting for about 50% of the country's nonfuel mineral imports. On average, from 2012 through 2014, Australia accounted for 38% of nonfuel mineral imports; Brazil, 12%; and Chile, 9%. In terms of value, Hong Kong and Japan were the two leading recipients of nonfuel mineral commodities from the Republic of Korea from 2012 through 2014. For that entire 3-year period, Hong Kong was the leading recipient, accounting for 29% of the total. Japan was the leading recipient in 2013 alone and accounted for 27% of the total from 2012 through 2014 (Korea Institute of Geoscience and Mineral Resources, 2015, p. 12–13).

Commodity Review

Metals

Copper.—Production of mined copper had not been reported since 2010. The Republic of Korea relied on imports to meet the raw material requirements for its copper refineries. In 2014, the country reported imports of about 1.6 million metric tons (Mt) of copper ore and concentrate and exports of about 22,566 metric tons (t) of refined copper. Chile was the leading supplier of imported copper ore and concentrate, followed by Australia, Peru, and Indonesia; other countries also supplied copper ore and concentrate to the Republic of Korea (Korea Institute of Geoscience and Mineral Resources, 2015, p. 29).

Gold.—About 96% of the Republic of Korea's gold production was mined in Jeonnam Province at the southwestern terminus of the country. Mined production of gold, which remained insignificant in the country, decreased by 31% in 2014 compared with that of 2013. Nevertheless, consumption of gold had been increasing since at least 2009. In 2014, imports of refined gold increased to about 17.2 t from 15.4 t in 2013, 12.6 t in 2012, 12.7 t in 2011, and 12 t in 2010. Exports of refined gold metal decreased to 14.5 t in 2014 from 16.9 t in 2013, 42.8 t in 2012, 43.4 t in 2011, and 47.1 t in 2010. Hong Kong was the leading recipient (by quantity) of the Republic of Korea's refined gold exports in 2014, followed by the Philippines, Mongolia, and Taiwan. The production of refined gold in the Republic of Korea in recent years remained at less than 50% of the country's known capacity (table 1; Korea Institute of Geoscience and Mineral Resources, 2015, p. 24–25).

Iron and Steel.—In 2014, domestic iron ore production amounted to 693,000 t and domestic consumption was 74 Mt. Australia and Brazil continued to be the first- and second-ranked suppliers, respectively, of iron ore and concentrate imports to the Republic of Korea. The country produced about 71 Mt of crude steel in 2014, which was an increase of 8% from that of 2013 and accounted for 4% of the global total in 2013. According to the International Steel Statistics Bureau, the Republic of Korea had the greatest year-on-year production increase in the Asia and the Pacific region in 2014 after being the only major country in the region to have recorded a decrease in 2013. The Republic of Korea remained the third-ranked steel-exporting country in Asia, after China and Japan. Prior to 2011, the Republic of Korea was a net importer of crude steel, but it had since become a net exporter; in 2014, its crude steel exports increased by 11% to 31.1 Mt compared with those of 2013. The country still imported significant quantities of crude steel. Steel imports increased by 18% in 2014 to 21.8 Mt compared with 18.5 Mt in 2013. The Republic of Korea was Asia's leading steel-importing country and the world's third-ranked steel-importing country in 2014 (table 1; International Steel Statistics Bureau, 2015; Korea Institute of Geoscience and Mineral Resources, 2015, p. 37; World Steel Association, 2016).

In July 2014, the International Trade Commission ruled that South Korean companies (along with companies in other countries, including India, the Philippines, Taiwan, Thailand, Turkey, Ukraine, and Vietnam) were selling steel pipes, tubes and fittings used by oil companies [also known as oil country tubular goods (OCTG)] at unfairly low prices on the U.S. market, thereby harming the domestic OCTG industry. As a result, the U.S. Department of Commerce imposed antidumping duties on imports of OCTG to reduce the imports of subsidized steel that were determined to have contributed to decreased sales, mill closures, and domestic job losses in the United States (Zacks Equity Research, 2014).

Industrial Minerals

Calcite, Dolomite, Limestone, and Marble.—The Republic of Korea met its demand for limestone resources of about 80 to 90 Mt/yr almost completely from domestic production. The country, however, did trade in quantities of limestone, including exports of 174,000 t and imports of 1.7 Mt in 2014. The majority of limestone imports came from Japan. In 2014, 75% of limestone production was consumed in the production of cement, 14% was consumed in the manufacture of steel products, and the rest was consumed by manufacturing in the construction, chemical, desulfurization (flue gas processes) and milling industries, and other unspecified uses. Japan was by far the leading recipient of calcareous minerals and stone from the Republic of Korea, followed by Indonesia, Taiwan, and China. In 2014, 50% of domestic calcite production was consumed to produce ground calcium carbonate for manufacturing; 22% was consumed by the construction industry; 16%, for cement production; and 7%, for desulfurization processes. The majority of domestic dolomite production was consumed by construction industries (31%), steel industries (31%), and agricultural industries (13%). The remainder was consumed to produce ground calcium carbonate for manufacturing (6%), chemical production and glass manufacturing (5% each), cement manufacturing (4%), and other unspecified uses (5%) (table 1; Korea Institute of Geoscience and Mineral Resources, 2015, p. 40–43).

Mineral Fuels and Related Materials

Petroleum, Natural Gas, and Refinery Products.—In 2014, the Republic of Korea's average year-on-year rate of consumption of petroleum decreased by 3% to 2.4 million barrels per day (about 875 million barrels per year. The country's dependence on foreign supplies (about 39% of the country's primary energy consumption in 2014 was generated from imported petroleum and other liquids) made it one of the world's 10 leading energy importers. The KNOC had accrued a domestic above-ground petroleum stockpiling capacity of 146 million barrels since its inception in 1979, and it had reported shares of foreign reserves of 1.3 billion barrels. Consumption of natural gas decreased by 9% to 47.8 billion cubic meters in 2014 compared with that of 2013. The Republic of Korea used naphtha as a feedstock for its petrochemical processing industry, which is much more expensive than using either coal or shale-based ethane; naphtha accounted for about 46% of total petroleum product demand. Exports of petrochemical products had been negatively affected by decreased demand from China and lower international prices for petrochemical commodities. The Republic of Korea was expected to import greater quantities of liquefied natural gas, including shale gas, from North America in order to meet demand for power generation and to satisfy increasingly strict environmental regulations (Lee, 2014; Jangkeun and Yongwon, 2015; Korea Institute of Geoscience and Mineral Resources, 2015, p. 50, 52–53; Korea National Oil Corp., 2015; U.S. Department of Energy, 2015).

Outlook

Economic growth in the Republic of Korea was not expected to change much in 2015 compared with that of 2014. Increased growth was projected in construction investment, exports, financial facilities investment, and private consumption. The value of industrial facility contracts was projected to decrease in 2015, particularly in the Middle East, owing primarily to an expectation that international prices for crude petroleum would remain low. Diminished growth in such emerging nations as Brazil and China as well as in Japan and Europe was seen as a potential hindrance to the Republic of Korea's economic growth. Apart from the petrochemical industry, the demand for petroleum in the Republic of Korea's was expected to decline in the long term owing to a decreasing population, greater energy efficiency, and competition from other fuels, including coal, natural gas, and nuclear power (Export Import Bank of Korea, 2015, p. 12).

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TABLE 1
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
METALS						
Cadmium, smelter		4,166	3,005	3,904	3,903	3,800
Copper:						
Mine output, Cu content		9	--	--	--	--
Metal, refined, primary and secondary		564,600	595,447	593,500	586,000	620,000
Gold:						
Mine output, Au content	kilograms	235	209	336	413	284
Metal, refined	do.	57,316	50,833	49,362	44,366	46,207
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand metric tons	513	542	593	663	693
Fe content	do.	287	303	332	371	426
Metal:						
Pig iron	do.	36,065 [r]	42,213	41,734	41,045	46,909
Ferroalloys:						
Ferromanganese		286,259	355,047	364,800	365,000 [e]	370,000 [e]
Ferrosilicomanganese		120,779	195,650	184,700	185,000 [e]	190,000 [e]
Total		407,038	550,697	549,500	550,000 [e]	600,000 [e]
Steel, crude	thousand metric tons	58,914	68,519	69,073	66,061	71,036
Lead:						
Mine output, Pb content		584	1,289	1,940	2,500	2,764
Metal, refined:						
Primary		197,900	256,851	280,000	227,700	280,000
Secondary		130,000	160,000	180,000	200,000	200,000
Molybdenum		388	378	377	428	479
Nickel, ferronickel		20,512	19,011	20,858	28,100	30,000 [e]
Silver:						
Mine output, Ag content	kilograms	2,187	2,649	2,925	3,897	3,289
Metal	do.	1,736	2,197	2,547	3,248	3,117
Zinc:						
Mine output, Zn content		385	343	1,434	1,749	1,919
Metal, primary		717,100	828,735	881,100	1,044,300	900,943
INDUSTRIAL MINERALS						
Calcite		1,435	1,880	2,025	1,095	2,426
Cement:						
Clinker	thousand metric tons	44,775	45,221	45,155	44,373	44,816
Hydraulic	do.	47,420	48,300	52,613	53,252	63,247
Total	do.	92,195	93,521	97,768	97,625	108,063
Clays:						
Acid		83,476	46,623	57,787	51,309	54,001
Bentonite		88,255	94,987	88,543	80,188	71,850
Kaolin		764,008	798,690	514,841	532,050 [r]	429,081
Pottery		198,267	253,082	281,762	327,336	253,668
Other		1,005,519	1,361,283	968,014	801,264	719,390
Total		2,139,525	2,554,665	1,910,947	1,792,147	1,527,990
Diatomaceous earth		2,200	5,150	6,000	34,000	65,893
Feldspar		496,511	384,221	360,413	343,241	544,058
Mica, all grades		36,486	31,260	25,594	25,143	25,000 [e]
Salt		222,509	372,230	308,847	421,259	303,510
Stone, sand and gravel:						
Dolomite	thousand metric tons	2,567	2,697	2,474	2,610	2,558
Limestone	do.	79,625	82,368	82,413	83,802	86,191
Marble	do.	39	38	35	8	8
Quartzite	do.	3,603	3,603	4,184	4,194	4,057
Sand, unspecified	do.	51,745	57,826	57,593	46,912	41,728

See footnotes at end of table.

TABLE 1—Continued
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
INDUSTRIAL MINERALS—Continued						
Talc and related materials:						
Pyrophyllite		673,936	510,708	483,133	524,881	622,865
Talc		5,729	15,608	21,625	2,808	5,484
Zeolites		242,190	231,420	245,285	221,298	203,051
MINERAL FUELS AND RELATED MATERIALS						
Petroleum, refinery products:						
Asphalt	thousand 42-gallon barrels	29,500	24,700	25,700	30,000	33,000
Butane	do.	14,500	14,200	13,500	13,900	15,700
Fuel oil	do.	4,500	4,300	3,400	2,700	2,300
Gasoline	do.	107,400	122,400	136,700	135,900	143,600
Jet fuel	do.	107,700	120,900	130,900	129,700	136,900
Kerosene	do.	39,400	37,400	31,800	30,700	23,300
Naphtha	do.	167,004	191,715	197,057	188,227	203,886
Propane	do.	10,600	11,100	12,400	12,000	12,500
Residual oil	do.	120,100	119,100	98,700	74,300	57,800
Total	do.	600,704	645,815	650,157	617,427	628,986

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.

[1] Table includes data available through December 4, 2015.

[2] In addition to the commodities listed, the Republic of Korea also produced bismuth, carbon black, coal, coke, graphite, gypsum, indium, magnesite, magnesium, phosphate rock, secondary iron, iron and steel semimanufactures, sulfur (as a byproduct of petroleum processing), titanium, thorium, and uranium, but available information is inadequate to make reliable estimates of output.

TABLE 2
REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bismuth, metal	metric tons	Korea Zinc Co. Ltd.	Onsan	500
Cadmium	do.	do.	do.	2,100
Do.	do.	Young Poong Corp.	Sukpo	2,100
Cement		Ssangyong Cement Industrial Co. Ltd.	Plants at Tonghae, Kwang Yang, Munkyung, Pukpyong, and Yeongwol	15,040
Do.		Sung Shin Cement Manufacturing Co. Ltd.	Tanyang plant	13,700
Do.		Tong Yang Major Corp.	Plants at Pukpyong and Samchok	11,580
Do.		Lafarge Halla Cement Corp.	Plants at Kwang Yang and Okkye	9,500
Do.		Hyundai Cement Co. Ltd.	Plants at Tanyang and Yongwol	8,600
Do.		Hanil Cement Manufacturing Co.	Plants at Chungbuk and Tanyang	7,200
Do.		Asia Cement Manufacturing Co. Ltd.	Plants at Daegu and Jaechon	4,600
Coal		Korea Coal Corp.	Mines at Changsung, Dogae, and Hwasoon	2,500
Copper, metal, primary		Korea Zinc Co. Ltd.	Onsan	24
Do.		LS-Nikko Copper Inc.	Changhang	60
Do.		do.	Onsan	510
Gas, natural		Korea National Oil Corp.	Ulleung Basin	NA
Gold:				
In concentrate	kilograms	Hangum Co. Ltd.	Muguk Mine, Haenam, Jeonnam (South Jeolla) Province	1,600
Refined	do.	Korea Zinc Co. Ltd.	Onsan	50,000
Do.	do.	LS-Nikko Copper Inc.	do.	60,000
Graphite		Kaerion Graphite Ltd.	Kangwon	NA
Do.		Wolmyong Mining Co.	do.	NA
Indium, metal	kilograms	Korea Zinc Co. Ltd.	do.	55,000
Iron ore		POSCO Ltd.	Mines at Sinyemi, Gangwon Province	600
Lead, metal, primary		Korea Zinc Co. Ltd.	Kangwon	300

See footnotes at end of table.

TABLE 2—Continued
REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Magnesium		Pohang Iron and Steel Co. Ltd.	Magnesium refinery plant, Gangneung City, Gangwon Province	10
Do.		do.	Magnesium metal sheet plant, Suncheon City, Jeonnam (South Jeolla) Province	3
Molybdenum	metric tons	Korea Resources Corp. (KORES)	Mine at Uljin; Smelter at Yeosu, Jeonnam (South Jeolla) Province	6,000
Do.	do.	NMC Resource Corp., 100%	Moland Mine at Daejang-ri, Geumseongmyeon, Jecheon-si, Chungcheongbuk-do District	900
Nickel:				
Ferronickel		Pohang Iron and Steel Co. Ltd.	Gwangyang ferronickel plant	30
Metal		Vale S.A., 25%, and Korea Zinc Co. Ltd., 19%	Onsan nickel refinery	30
Petroleum, refinery products	thousand 42-gallon barrels per day	SK Energy Corp.	Ulsan and Inchon	1,115
Do.	do.	GS-Caltex Corp.	Yocheon (Yosu)	785
Do.	do.	Hyundai Oil Refinery Co.	Daesan and Inchon	589
Do.	do.	S-Oil Corp.	Onsan	669
Pyrophyllite		NA	Wan-Do, Sungsan, Hwansan, Okmesan, Dae-Do, and Chin-Do Mines in Haenam	446
Do.		NA	Nilyang, Yangsan, Kimhae, Pusan, and Kyong-Nam Mines in Dong-Nae	446
Silver:				
In concentrate	kilograms	Hangum Co. Ltd.	Haenam, Jeonnam (South Jeolla) Province	3,700
Refined	metric tons	Korea Zinc Co. Ltd.	Onsan	1,700
Do.	do.	LS-Nikko Copper Inc.	do.	370
Steel, crude		POSCO Ltd.	Kwangyang (Gwangyang) Works	15,000
Do.		do.	Pohang Works	17,400
Do.		Hyundai Steel Co. Ltd.	Inchon Plant	4,800
Do.		do.	Pohang Plant	3,200
Do.		do.	Dangjin Plant	23,000
Do.		Dongkuk Steel Mill Co. Ltd.	Inchon Works	1,450
Do.		do.	Pohang Works	3,600
Do.		Korea Iron and Steel Co. Ltd.	Masan and Changwon Works	1,200
Zinc		Korea Zinc Co. Ltd.	Onsan	560
Do.		Young Poong Corp.	Sukpo	350

Do., do. Ditto. NA Not available.

THE MINERAL INDUSTRY OF LAOS

By Yolanda Fong-Sam

In 2014, Laos produced a variety of mineral commodities, including barite, copper, gold, iron ore, lead, and silver (table 1). Laos had a variety of undeveloped mineral resources, and the Government recognized mining as a critical sector of the economy and continued to support the development of the sector by promoting domestic and foreign investment. Employment in the mining sector, which comprised about 0.3% of the total population of Laos, was 15,381, which represented an increase of 3.8% compared with 14,819 in 2013.

During 2014, the Government continued its plans to improve the country's infrastructure, which included the construction of dams, railway systems, and roads, and the restoration of many hydropower plants nationwide. The Nam Sim and Nam Hao hydropower projects, which are located in Houaphanh Province, were scheduled to be completed in 2015. The Nam Sim project had a designed generation capacity of 8 megawatts (MW), and the Nam Hao project had an installed generation capacity of 15 MW. In August 2014, the Asian Development Bank (ADB) approved $217 million in funds for the construction of the Nam Ngiep 1 hydropower project, which would have a designed capacity of 290 MW and was expected to be commissioned in 2019. The electricity generated from this project would be exported mainly to neighboring Thailand. Other planned infrastructure projects included the construction of the Nam Neun 1 and Nam Neun 3 hydropower projects to start in 2016. The Nam Neun 1 would be located in Xieng Khuang Province, and would have an installed capacity of 124 MW. The Nam Neun 3 project would be located in Houaphanh Province and would have an installed capacity of 60 MW. The estimated cost of the project was $400 million, and production was expected to start in 2020. The Government estimated that about 90% of households in the country would have access to electricity by 2020 (Ministry of Energy and Mines, 2014a–c).

Minerals in the National Economy

In 2014, the value of Laos's industrial sector, which included the construction, electricity generation, manufacturing, and mining and quarrying sectors, increased by 8.5% and contributed 28.7% to Laos' real gross domestic product (GDP) (at constant 2002 prices) compared with an increase of 28.6% in 2013. The construction sector contributed 7% to the GDP in 2014 compared with 6.8% in 2013. During 2014, the mining and quarrying sector was affected by low commodity prices and a decrease in domestic gold output, which caused the sector to grow at a slower pace—5.2% compared with 6.6% in 2013. The mining and quarrying sector contributed about 6.3% to Laos's GDP in 2014 compared with about 6.6% in 2013 (Bank of the Lao PDR, 2014, p. 3, 21).

Production

The production of several mineral commodities increased significantly in 2014, such as clay (by 272%), barite (192%), potash (144%), tin (50%), salt (43%), and silver (23%). On the other hand, production decreased for limestone (by 80%), lignite (76%), sandstone (68%), gold (23%), and silicon (20%) (table 1).

Structure of the Mineral Industry

According to the Department of Mines (DOM), by yearend 2013 (the latest year for which comprehensive data were available), a total of 211 mining companies were operating in Laos, including about 150 companies that were in the prospecting and exploration phases and were monitored by the Department of Geology and Mines (DGM) of the Ministry of Natural Resources and Environment (MONRE). A total of 61 mining companies—35 that were joint ventures, 14 that were locally owned, and 12 that were foreign owned—were in the mining operation and mineral-processing phases, and were being monitored by the DOM of the Ministry of Energy and Mines (MEM) (Department of Mineral Resources of Thailand, 2013).

The MONRE was created in 2011 from the merger of the Water Resource and Environment Administration (WREA) with departments of the National Land Management Authority (NLMA) and the Geology Department, and the Forest Conservation Divisions within the Ministry of Agriculture and Forestry (MAF). The MEM is the Government agency that manages and promotes the mining, processing, and trade of mineral products. The DOM oversees mining company compliance with the country's mining regulations and contracts; oversees and implements the mineral law, mine safety, and mine closure regulations; creates the necessary regulations and guidelines for the promotion of the mining and metallurgical sector; and issues, rejects, extends, and withdraws mining licenses (Department of Mineral Resources of Thailand, 2013; The REDD Desk, 2015).

In 2014, the main producers of copper, gold, and silver in Laos were Minerals and Metals Group, Lane Xang Minerals Ltd. (MMG LXML), which was a subsidiary of MMG Ltd. of Hong Kong (90% interest) and the Government (10% interest), and Pan Australian Resources Ltd. of Australia. The country's major mineral industry facilities and their capacities are listed in table 2.

Mineral Trade

In 2014, the total value of trade in Laos was reported as $6.93 billion, which represented an increase of 29.8% compared with $5.34 billion (revised) in 2013. The country's total exports were valued at about $2.66 billion in 2014, which was an increase of 17.6% compared with $2.26 billion in 2013. The value of all mineral commodity exports amounted to

THE MINERAL INDUSTRY OF LAOS

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During 2014, the Government continued its plans to improve the country's infrastructure, which included the construction of dams, railway systems, and roads, and the restoration of many hydropower plants nationwide. The Nam Sim and Nam Hao hydropower projects, which are located in Houaphanh Province, were scheduled to be completed in 2015. The Nam Sim project had a designed generation capacity of 8 megawatts (MW), and the Nam Hao project had an installed generation capacity of 15 MW. In August 2014, the Asian Development Bank (ADB) approved $217 million in funds for the construction of the Nam Ngiep 1 hydropower project, which would have a designed capacity of 290 MW and was expected to be commissioned in 2019. The electricity generated from this project would be exported mainly to neighboring Thailand. Other planned infrastructure projects included the construction of the Nam Neun 1 and Nam Neun 3 hydropower projects to start in 2016. The Nam Neun 1 would be located in Xieng Khuang Province, and would have an installed capacity of 124 MW. The Nam Neun 3 project would be located in Houaphanh Province and would have an installed capacity of 60 MW. The estimated cost of the project was $400 million, and production was expected to start in 2020. The Government estimated that about 90% of households in the country would have access to electricity by 2020 (Ministry of Energy and Mines, 2014a–c).

Minerals in the National Economy

In 2014, the value of Laos's industrial sector, which included the construction, electricity generation, manufacturing, and mining and quarrying sectors, increased by 8.5% and contributed 28.7% to Laos' real gross domestic product (GDP) (at constant 2002 prices) compared with an increase of 28.6% in 2013. The construction sector contributed 7% to the GDP in 2014 compared with 6.8% in 2013. During 2014, the mining and quarrying sector was affected by low commodity prices and a decrease in domestic gold output, which caused the sector to grow at a slower pace—5.2% compared with 6.6% in 2013. The mining and quarrying sector contributed about 6.3% to Laos's GDP in 2014 compared with about 6.6% in 2013 (Bank of the Lao PDR, 2014, p. 3, 21).

Production

The production of several mineral commodities increased significantly in 2014, such as clay (by 272%), barite (192%), potash (144%), tin (50%), salt (43%), and silver (23%). On the other hand, production decreased for limestone (by 80%), lignite (76%), sandstone (68%), gold (23%), and silicon (20%) (table 1).

Structure of the Mineral Industry

According to the Department of Mines (DOM), by yearend 2013 (the latest year for which comprehensive data were available), a total of 211 mining companies were operating in Laos, including about 150 companies that were in the prospecting and exploration phases and were monitored by the Department of Geology and Mines (DGM) of the Ministry of Natural Resources and Environment (MONRE). A total of 61 mining companies—35 that were joint ventures, 14 that were locally owned, and 12 that were foreign owned—were in the mining operation and mineral-processing phases, and were being monitored by the DOM of the Ministry of Energy and Mines (MEM) (Department of Mineral Resources of Thailand, 2013).

The MONRE was created in 2011 from the merger of the Water Resource and Environment Administration (WREA) with departments of the National Land Management Authority (NLMA) and the Geology Department, and the Forest Conservation Divisions within the Ministry of Agriculture and Forestry (MAF). The MEM is the Government agency that manages and promotes the mining, processing, and trade of mineral products. The DOM oversees mining company compliance with the country's mining regulations and contracts; oversees and implements the mineral law, mine safety, and mine closure regulations; creates the necessary regulations and guidelines for the promotion of the mining and metallurgical sector; and issues, rejects, extends, and withdraws mining licenses (Department of Mineral Resources of Thailand, 2013; The REDD Desk, 2015).

In 2014, the main producers of copper, gold, and silver in Laos were Minerals and Metals Group, Lane Xang Minerals Ltd. (MMG LXML), which was a subsidiary of MMG Ltd. of Hong Kong (90% interest) and the Government (10% interest), and Pan Australian Resources Ltd. of Australia. The country's major mineral industry facilities and their capacities are listed in table 2.

Mineral Trade

In 2014, the total value of trade in Laos was reported as $6.93 billion, which represented an increase of 29.8% compared with $5.34 billion (revised) in 2013. The country's total exports were valued at about $2.66 billion in 2014, which was an increase of 17.6% compared with $2.26 billion in 2013. The value of all mineral commodity exports amounted to

$1.29 billion (48% of total exports) and that of electricity exports amounted to $570 million (21.4% of total exports). Among the mineral commodities exported by Laos, copper was valued at $1.07 billion, or 40% of total exports, and a 40% increase in value compared with that of 2013, and gold was valued at $140 million, or 5.3% of total exports, which was about a 9% decrease compared with that of 2013 (Bank of the Lao PDR, 2014, p. 35).

The total value of Laos' imports in 2014 increased by about 39% to $4.27 billion from $3.08 million (revised) in 2013, of which electricity imports increased by about 16.4% to about $79 million from $67.8 million in 2013. Iron and steel imports, most likely used in the construction and infrastructure sectors, amounted to $697 million; crude oil, fuel and related material imports totaled $700 million; and gold and silver imports combined totaled $76 million (Bank of the Lao PDR, 2014, p. 35).

Commodity Review

Metals

Bauxite and Alumina.—The Laos Bolaven Plateau bauxite project, which is located in the southern part of the country, was being developed by Sino Australian Resources (Laos) Co., Ltd. (SARCO). SARCO was a joint venture between China Nonferrous Metals Industry's Foreign Engineering and Construction Co., Ltd. of China (NFC) (51% interest) and ORD River Resources Ltd. of Australia (49% interest). SARCO had two tenements on the property—the LSI tenement, which covered an area of 66 square kilometers (km²), and the Yuqida tenement, which covered an area of 421 km², for a total area of 487 km². Once the permits and studies had been granted and performed, the joint venture planned to build a bauxite mine and an alumina refinery as part of the project. In May, Southwest Pacific Bauxite (HK) Ltd. (Southwest) of Australia offered to purchase ORD's interest in the Bolaven project. The offer was accepted under several conditions, including payment (by Southwest) of an initial $300,000 as a fee for a 12-month period of exclusivity for Southwest to exercise its option to purchase interest in the project. If the company were to exercise the purchase option, then Southwest would pay $2 million in cash and $3 million worth of its shares for the purchase of ORD's SARCO interest. On November 28, ORD announced that it would officially change its name to Vango Mining Ltd. on December 15 (ORD River Resources Ltd., 2014, p. 10; Thomson Reuters, 2014).

Copper, Gold, and Silver.—In 2014, the Sepon copper-gold project produced a total of 88,541 metric tons (t) of copper cathodes, and 11 kilograms (kg) of gold, which represented a decrease of 1.7% for copper and about 99% for gold compared with that of 2013. The significant decrease in gold production was attributed to MMG placing its gold operations at the Sepon Mine on care-and-maintenance status starting in December 2013 owing to declining global gold prices (MMG Ltd., 2014, p. 7, 16, 44).

PanAust Ltd. of Australia, through its wholly owned subsidiary Pan Mekong Exploration Pty. Ltd., owned a 90% interest in the Lao-registered company Phu Bia Mining Ltd. (PBM), which managed the Phu Kham copper-gold mine, and the Government owned the remaining 10% interest. The Government and PBM had a mineral exploration and production agreement that regulated exploration and mining within the company's contracted area of 2,636 km². In 2014, the Phu Kham copper-gold mine, which is located approximately 140 kilometers (km) north of the capital city of Vientiane, produced 71,155 t of copper in concentrate, which was an increase of 9.7% compared with that of 2013 (table 1). The mine also produced 2,109 kg of gold, which represented a decrease of 4.8% compared with the 2,215 kg produced in 2013; and 11,597 kg of silver, which was an increase of 17.3% compared with the 9,883 kg produced in 2013. Most of the increases in production were the result of increased production levels and lower operating costs owing to the implementation of expansions at the Phu Kham facility that took place in 2013 and 2014. The slight decrease in gold production was mainly attributed to low grades mined during the year. The Phu Kham Mine was expected to produce between 73,000 t and 76,000 t of copper in concentrate in 2015 and to reach a projected peak of 90,000 t between 2018 and 2019 (PanAust Ltd., 2014, p. 2, 3, 9).

PanAust's mineral resource interests in Laos also included the Ban Houayxai gold-silver project, which is located approximately 25 km west of the Phu Kham copper-gold operation. The Ban Houayxai project was an open pit mine that produced 3,140 kg of gold in 2014, which was a decrease of 10.3% compared with the 3,501 kg of gold produced in 2013, and 28,209 kg of silver, which was an increase of 42.2% compared with the 19,832 kg of silver produced in 2013. In 2015, PanAust projected that the annual production of gold at the Ban Houayxai Mine would remain steady at about 3,000 kg (PanAust Ltd., 2014, p. 3, 9).

The Phonsavan copper-gold project consisted of two copper deposits—KTL and Tharkhek—that are located within 5 km of each other and about 100 km from the Phu Kham project. In 2014, PanAust completed a feasibility study for developing the KTL copper-gold deposit as a satellite open pit mine of the Phu Kham project. The study determined that an estimated capital investment of $52 million would be required to develop the project. In July, the company submitted an environmental and social impact assessment of the project to the Government for evaluation (PanAust Ltd., 2014, p. 10).

Iron Ore.—In March, an iron-ore-processing plant located in Ban Boneng (a village in the Hinboun District, Khammouane Province) was commissioned. The plant was located about 200 km southeast of Vientiane. The facility was expected to comprise a processing plant, a tailings dam, roads, and a water management system, and to have a processing capacity of 200 metric tons per day (t/d) of iron. The reported grade was expected to include 75% iron ore and 25% clay. No additional information was available, nor could it be confirmed by the Government; therefore the plant is not included in table 2 (Jurutera Adda Sdn Bhd Consulting Engineer, 2015; Shanghai World State Machinery Co. Ltd., 2015).

Zinc.—By yearend 2014, Padaeng Industry Public Co. Ltd. of Thailand, through its wholly owned subsidiary Padaeng Industry (Laos) Co. Ltd., announced that it was continuing negotiations with an investor who was interested in developing the company's 400-km² zinc project in Vientiane Province. Padaeng Industry expected negotiations to conclude in 2015. In November 2013, Padaeng Industry had ceased all exploratory activities at its zinc project. The decision was based on extensive assessments in which the company was required to invest significantly and to use an alternative drilling method to proceed with the exploration phase of the project. By yearend 2013, the project had been put up for sale (Padaeng Industry Public Co. Ltd., 2015, p. 54).

Industrial Minerals

Cement.—In May, Siam Cement Group (SCG) of Thailand announced plans to build a new 1.8-million-metric-ton-per-year (Mt/yr)-capacity cement plant in Laos with an estimated investment of $370 million. The company was expected to commission the plant by the second quarter of 2017. In November, SCG announced that it had received authorization by the Government to carry out a surveying study to evaluate the availability of raw materials and potential locations that would support building another cement plant in the country. SCG proposed constructing the plant in Boualapha District in Khammouane Province (Global Cement, 2014a, b).

Potash.—In November, FYI Resources Ltd. of Australia, which was involved in the development of potash projects in Thailand and other locations, announced the expansion of its business in Laos. The company targeted a 108-km² area in the Vientiane Basin region near the country's southern border with Thailand as the location for the project after conducting extensive reviews of the geologic features of the area. The company created the Vientiane Basin Potash joint venture through a memorandum of understanding; the joint venture consisted of FYI Resources (75%); GM Consulting, which was a wholly owned subsidiary of the Greater Mekong Development Group (15%); and the Government of Laos (10%) (FYI Resources Ltd., 2014).

Outlook

In 2015, the Association of Southeast Asian Nations (ASEAN) is expected to fully implement the ASEAN Economic Community (AEC), which consists of a regional economic integration plan for the member countries of Brunei, Burma (also called Myanmar), Cambodia, Indonesia, Laos, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. The resulting economic integration would allow for a single market and production base, regionally equitable economic development, and a regional integration into the global economy. The integration would also include unrestricted trade of goods, investments, skilled labor, services, and flows of capital (Association of Southeast Asian Nations, 2015).

The expected integration of Laos into the AEC in 2015, combined with the accession of the country into the World Trade Organization in 2013, is expected to boost economic development, increase foreign direct investment, attract investment interest, and expand the country's economic cooperation with other Southeast Asian countries (World Trade Organization, 2013).

The production of copper, gold, and silver is expected to increase as projects and expansions are commissioned in 2014, including the Phu Kham project. The Phu Kham Mine is projected to reach its production capacity of 90,000 t/yr of copper concentrate between 2018 and 2019.

The production of many construction minerals was expected to increase in the near future to support the high demand for these mineral commodities as the Government moves forward with its plans to improve and further develop the country's infrastructure, including the construction of dams, railway systems, and roads, and the restoration of many hydropower plants nationwide. Many projects that were under construction in recent years are set to commence between 2015 and 2020. These projects are expected to contribute to the social and economic development of the country and to enable the Government to achieve its plans to provide access to electricity to about 90% of all households in the country by 2020.

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TABLE 1
LAOS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	2010	2011	2012	2013	2014
Antimony, Sb content	530	1,456	1,042	1,607 [r]	1,239
Barite[e]	17,500 [3]	2,500	21,900	10,500 [r, 3]	30,610
Cement[e]	1,200,000	1,300,000	1,500,000	1,500,000	1,500,000 [e]
Clay, common	1,901,530	609,840	512,587	445,714 [r]	1,656,475
Coal:					
Anthracite	211,721	166,609	133,583	104,260 [r]	110,317
Lignite	501,622	511,700	578,068	403,925 [r]	99,144
Copper:					
Mine output, Cu content	67,806	59,897	63,285	64,885 [3]	71,155
Metal, refined	64,241	78,859	86,295	90,030 [3]	88,541
Gold, mine output, Au content kilograms	5,061	3,984	6,415	6,838 [3]	5,265
Gypsum, mine output	553,396	686,150	578,543	772,138 [r]	707,908
Iron ore:					
Gross weight	50,900	42,700	316,400 [r]	904,757 [r]	1,148,571
Fe content	31,565	26,471	196,172 [r]	560,949 [r]	712,114
Lead, mine output, Pb content	2,270	2,921	4,510	1,000 [r]	--
Limestone	3,106,724	997,591	1,014,000	3,781,176 [r]	773,148
Potash, K_2O content	NA	NA	42,798	86,499 [r]	210,983
Salt, rock	13,421	23,395	11,980	6,099 [r]	8,706
Sandstone	3,695,838	339,331	1,214,668	1,211,899	391,186
Silicon, metal, exports	7,792	3,001	15,301	11,972	9,528
Silver, mine output, Ag content kilograms	17,188 [r]	18,038 [r]	20,081 [r]	32,262	39,806
Tin, mine output, Sn content	925	674	762	579 [r]	866
Zinc, mine output, Zn content	1,500 [r]	1,600 [r]	1,600 [r]	1,500 [r]	--

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. NA Not available. -- Zero

[1] Table includes data available through October 27, 2015.

[2] In addition to the commodities listed, crude construction materials (such as sand and gravel and varieties of stone) and sapphire were produced irregularly.

[3] Reported figure.

TABLE 2
LAOS: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity^{e}
Barite		Barite Mining Co., Inthavong Mining Co., Lao Development Construction Co., Phethongkham Co., Oravan Barite Co., and Singphooufar Co.	Muongfuong and Sanakham, Vientiane Province	30,000 [1]
Cement		Lao Cement Co. Ltd., a joint venture between China Yunnan Corp. for International Techno-Economic Cooperation and Lao State Agricultural Industry Development Enterprise Imp-Exp & General Service	Vang Vieng Cement Plant No. I, Vientiane Province	100,000
Do.		do.	Vang Vieng Cement Plant No. II, Vientiane Province	240,000
Do.		Lao Cement Industry Co. Ltd	Thakhek Cement Plant, Khammouane Province	850,000
Do.		Luang Prabang Cement Co. Ltd.	Luang Prabang Cement Plant, Luang Prabang Province, 340 kilometers from Vientiane	100,000
Do.		Wanrong Cement I	Vangvieng, Vientiane Province	78,000
Do.		Wanrong Cement II (Yunnan Industrial Economic Co., 60%, and Agricultural and Forestry Development and Service Co. of Laos, 40%)	do.	200,000
Do.		Wanrong Cement III	Savannakhet Province	200,000
Do.		Zhongyayici Co.	Saravan cement plant, Saravan Province	450,000
Coal:				
Anthracite		Agriculture Industry Development Enterprises	do.	60,000
Lignite		Viengphoukha Coal Mine Co. Ltd.	Viengphoukha, Luangnamtha Province	300,000
Copper:				
Mine output, Cu content		Phu Bia Mining Ltd. (wholly owned subsidiary of PanAust Ltd., 90%, and Government, 10%)	Phu Kham copper-gold operation located in Xaisomboun special zone, 120 kilometers north of Vientiane, Vientiane Province	65,000
Metal, refined		Lane Xang Minerals Ltd. (MMG LXML) (MMG Ltd.), 90%, and Government, 10%	Sepon, Vilabouly District, Savannakhet Province	93,000
Gemstone (sapphire)	carats	Bokeo Mining Co. Ltd.	Bokeo Province	300,000
Do.	do.	Buhae Industrial Corp.	Houaxay District, Bokeo Province	500,000
Do.	do.	Lao International Trade and Service	do.	400,000
Gold, mine output, Au content	kilograms	Lane Xang Minerals Ltd. (MMG LXML) (MMG Ltd.), 90%, and Government, 10%	Sepon, Vilabouly District, Savannakhet Province	7,500
Do.	do.	Phu Bia Mining Ltd. (wholly owned subsidiary of PanAust Ltd., 90%, and Government, 10%)	Phu Kham copper-gold operation located in Xaisomboun special zone, 120 kilometers north of Vientiane, Vientiane Province	2,000
Do.	do.	PanAust Ltd.	Ban Houayxai gold-silver project located approximately 25 kilometers west of the Phu Kham copper-gold operation	3,100
Gypsum		Lao State Gypsum Mining Co. Ltd.	Champhon District, Savannakhet Province	200,000
Do.		Mining Development Economy Cooperation (OEDCD)	Tha Kect District, Khammouane Province	150,000
Do.		Savan Gypsum Mining Co. Ltd.	Champhon District, Savannakhet Province	70,000
Do.		LAVICO Co. Ltd. (a Laos-Vietnam joint venture)	Xebangfay District, Khammouane Province	100,000
Iron ore		Lao SPG CMC Mining Co. Ltd. (a subsidiary of Gimpex Ltd.)	Houaphanh Iron Ore Mine, Xamneua District, Houaphanh Province	25,000
Limestone		Laos Cement Co. Ltd. (a Laos-China joint venture)	Vangvieng, Vientiane Province	250,000
Do.		Agriculture Industry Development Enterprises	do.	150,000
Do.		V.S.K. Co. Ltd.	Tha Kect District, Khammouane Province	150,000
Do.		Phanangnon Co. Ltd.	do.	100,000

See footnotes at end of table.

TABLE 2—Continued
LAOS: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Potash		SinoAgri Mineral Resources Exploration Ltd. (a joint venture between Beijing Jiang Zhi Yuan Investment Ltd. and China National Agricultural Means of Production Group Corp.)	Plant in Sakhon Nakon Basin in the Khammouane Province	100,000
Do.		Laotian Potash Mining Industry Ltd. Co.	Potassium chloride plant, Vientiane Province	50,000
Silver	kilograms	Phu Bia Mining Ltd. (wholly owned subsidiary of PanAust Ltd., 90%, and Government, 10%)	Phu Kham copper-gold operation located in Xaisomboun special zone, 120 kilometers north of Vientiane, Vientiane Province	14,000
Do.	do.	PanAust Ltd.	Ban Houayxai gold-silver project located approximately 25 kilometers west of the Phu Kham copper-gold operation	20,000
Tin, mine output, Sn content		Lao-North Korea Tin Mines	Hinboun District, Khammouane Province	120
Do.		S V Mining Co. Ltd.	do.	300

[e] Estimated. Do., do. Ditto.

[1] Estimated combined capacity of the six local barite mining companies.

THE MINERAL INDUSTRY OF MALAYSIA

By Lin Shi

In 2014, Malaysia's real gross domestic product (GDP) increased by 6.0% compared with an increase of 4.7% in 2013 and an increase of 5.6% in 2012. An increase in domestic demand and growth in the country's exports contributed to economic growth. The output of the mining and quarrying sector increased by 3.1% in 2014 compared with increases of 0.7% (revised) in 2013 and 1.0% (revised) in 2012. The rate of growth in the manufacturing sector increased by 6.2% in 2014 compared with increases of 3.5% (revised) in 2013 and 4.8% in 2012. The rate of growth in the construction sector increased by 11.6% in 2014 compared with increases of 10.9% in 2013 and 18.6% in 2012 (Bank Negara Malaysia, 2015, p. 14).

Minerals in the National Economy

Malaysia has historically been a major source of tin. Most of the high-grade tin reserves in the country have been depleted, however, or were under developed lands. Malaysia had tin-associated mineral resources, such as ilmenite, monazite, struverite [a niobium (columbium) and tantalum-bearing mineral], and zircon. Malaysia also had identified mineral resources of barite, bauxite, clays, coal, copper, gold, iron ore, limestone, natural gas, petroleum, silica, and silver. After many years of exploitation, however, such minerals as barite, copper, and ilmenite were depleted. During the 20th century, mineral production played an important role in Malaysia's national economy. In 2014, the mining and quarrying activity accounted for 7.9% of the country's real GDP (Bank Negara Malaysia, 2015, p. 17).

Government Policies and Programs

In Malaysia, mineral sector activity is governed by the Mineral Development Act 1994 and the State Mineral Enactment. The Mineral Development Act 1994 defines the power of the Federal Government to regulate and inspect mineral exploration, mining, and related activities. The State Mineral Enactment gives the States the power to issue mineral prospecting and exploration licenses and mining leases. Apart from paying a corporate tax to the Federal Government, mine and quarry operators are required to pay value-based royalties to the State in which their operation is located. Royalty rates depend on the mineral commodity and on the assessment of each of the individual States (Malaysianminerals.com, 2016).

In June 2010, Malaysia issued the Tenth Malaysia Plan, which included the Government Transformation Programme and the New Economic Model, aimed at improving the country's economy, inclusiveness, and sustainability, and providing the plan for the country's development for the next 5 years. The Government Transformation Programme is in line with the national mission of achieving Vision 2020, which was introduced in 1991 and was intended to transform Malaysia into a developed country. Among its stated goals were increases in the efficiency of public services and improvement of Government accountability. The New Economic Model was issued by the National Economic Advisory Council and last updated in 2012; it was aimed at transforming the country's economy into one that was market-based, regionally integrated, entrepreneurial, and innovative (Economic Planning Unit, 2015a: 2015b, p. 13, 98–99; 2015c; Wawasan2020.com, 2015a, b).

Production

The levels of production of most of the country's mineral commodities stayed about the same in 2014 as in 2013. The mineral commodities that had significant increases in production were bauxite, which increased by 1,461%; pig iron, by 72%; and clays, by 11%. Production decreased for several mineral commodities in 2014. Among the most significant decreases were ilmenite (gross weight), by 49%; iron ore (gross weight), by 21%; and iron ore (Fe content), by 13% (table 1).

Structure of the Mineral Industry

Metallic and nonmetallic mineral-processing facilities were operated by private companies incorporated in Malaysia. The state-owned Petroliam Nasional Berhad (Petronas), together with its subsidiaries, operated as an integrated oil and gas company in Malaysia and internationally. Petronas engaged in the exploration, development, production (liquefaction, manufacturing, and refining), transportation, and sale (trading and marketing) of crude oil and natural gas products (liquefied natural gas [LNG] and petroleum). It also owned and operated a network of retail stations (table 2; Bloomberg, 2015).

Mineral Trade

In 2014, Malaysia's total trade increased by 5.9% to $482.9 billion from $456.3 billion in 2013. Total exports increased by 6.4% to $255.3 billion from $239.9 billion in 2013 and total imports increased by 5.3% to $227.8 billion from $216.4 billion in 2013. Malaysia had a trade surplus in 2014. Exports of mineral fuels, mainly LNG, accounted for 22% of total exports, and exports of chemicals accounted for 7% of total exports. Imports of mineral fuels accounted for 17% of total imports, and imports of chemicals accounted for 10% of total imports. According to the National Trade Promotion Agency of Malaysia, the country's major trading partners in 2014 were Australia, the Association of Southeast Asian Nations (whose member countries were Brunei, Cambodia, Indonesia, Laos, Myanmar [also known as Burma], the Philippines, Singapore, Thailand, and Vietnam), China (including Hong Kong), Japan, the Republic of Korea, European Union member countries, and the United States. In 2014, there was steady demand for Malaysia's mineral commodities, such as bauxite and LNG, and increased demand for Malaysia's manufactured products, in particular electrical and electronic products. Japan and the

United States were Malaysia's key export markets, and in 2014, emerging markets, such as Kenya, Mexico, and other countries in Africa, Central Asia, and South Asia, increased their demand for Malaysia's commodities. The value of Malaysia's exports to the United States totaled $30,420 million, and the value of goods imported from the United States totaled $13,068 million, with about a 50% surplus in trade in 2014 (National Trade Promotion Agency of Malaysia, The, 2015; U.S. Census Bureau, 2015).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—According to the Malaysian Chamber of Mines, bauxite was produced in Malaysia from a mine located in the State of Johore. Production of bauxite in 2014 was estimated to be 3.26 million metric tons (Mt) compared with 208,770 metric tons (t) in 2013 and 121,873 t in 2012. All the production was exported to the other Asian countries. Malaysia's remaining bauxite reserves were small, but bauxite resources were recently discovered in the States of Sabah and Sarawak. In 2014, Malaysia exported about 3.7 Mt of bauxite and imported 11,184 t of bauxite compared with exports of 17,422 t (revised) and imports of 5,221 t in 2013. Because Indonesia banned exports of bauxite (and some other mineral commodities and materials) early in the year, Malaysia became an important bauxite supplier to China. Demand for Malaysian bauxite in international markets was expected to continue to increase. Press Metal Sarawak Sdn Bhd (a subsidiary of Press Metal Berhad) operated aluminum smelters at Mukah and at Similaijau in the State of Sarawak. Press Metal expected to have the capacity to produce 890,000 metric ton per year (t/yr) of aluminum, including 121,000 t/yr of billet, in place by 2016 (China Metal Bulletin, 2014; Aluminum Market Outlook, 2015, p. 2–14; Clean Malaysia, 2015; Home, 2015; Malaysianminerals.com, 2015b; Monthly Statistical Bulletin, 2015; Moran, 2015).

Copper.—In 2014, Malaysia had no reported output of copper concentrates and did not produce refined copper products. The country imported copper from India, the Republic of Korea, and Russia to meet its demand. A drilling campaign conducted in the 1980s identified the Mengapur polymetallic deposit located in Pahang State and estimated 224 Mt of reserves at an average grade of about 0.6% copper equivalent with a cutoff grade of about 0.3% copper equivalent. Monument Mining Ltd. of Canada, through its Malaysian subsidiary Monument Mengapur Sdn Bhd (MMSB), acquired a 100% interest in the Mengapur Mine in 2012. The company conducted a resource survey and an evaluation study of the mine in 2013 and continued a preliminary economic assessment in 2014 to maximize the economic value of the project. The Mengapur polymetallic project is located in the State of Pahang approximately 130 kilometers (km) southeast of Monument's wholly owned Selinsing gold mine and 75 km northwest of the Malaysian port city of Kuantan (Monthly Statistical Bulletin, 2015; Monument Mining Ltd., 2015a).

Gold.—Malaysia's operating gold mines were located in the States of Kelantan, Pahang, and Terengganu. More than 90% of mined gold was from the State of Pahang, which was the location of metal refining facilities for Avocet Mining plc United Kingdom's gold mine at Penjom, Monument's Selinsing gold mine at Bukit Selinsing Koyan, and Raub Australian Gold Mining Sdn Bhd's gold mine at Raub. Malaysia produced about 4,000 kilograms (kg) of gold in 2014, which was an increase of about 5% from the 3,800 kg (revised) produced in 2013, and a decrease of about 13% from the 4,600 kg produced in 2012. The Selinsing gold mine was a leading gold producer in the country and reported to produce 1,119 kg (35,983 troy ounces) in fiscal year 2014 (ending June 30) compared with 1,648 kg (52,982 troy ounces) in fiscal year 2013 and 1,387 kg (44,585 troy ounces) in fiscal year 2012. Monument Mining's processing plant processed more than 1 Mt of ore at an average grade of 1.31 grams per metric ton (g/t) gold in fiscal year 2014; ore processed in 2013 had an average grade of 2.07 g/t gold and, in 2012, 4.24 g/t gold (Monthly Statistical Bulletin, 2015; Monument Mining Ltd., 2015b).

Iron and Steel.—Malaysia's crude steel production consisted of cast semimanufactured products, such as billets, blooms, and slabs. Malaysia's iron mines are located in the States of Johor, Pahang, Perak, and Terengganu. Iron ore mined in Malaysia was either consumed by domestic industries or exported to China. Malaysian iron and steel producers imported lumps and pellets and steel scrap as raw materials for steelmaking. In 2014, Malaysia mined about 9.6 Mt of iron ore, and produced about 2.8 Mt of iron and steel bars and rods. In 2014, the MMSB (the owner of the Mengapur project) entered into a binding purchase and profit-sharing agreement with Malaysia's Malaco Mining Sdn. Bhd (Malaco), which was the previous owner of the project and the present owner of the magnetite found in the iron-rich topsoil that overlies much of the project. The agreement granted Monument the right to process and sell magnetite extracted from the topsoil that overlies Area C. Monument would also purchase approximately 1.2 Mt of stockpiled magnetite as initial inventory at the area (Monthly Statistical Bulletin, 2015, p. 53, 68; Monument Mining Ltd., 2015a; World Steel Association, 2015, p. 4).

Manganese.—Malaysia's manganese output gradually increased from 2005 to 2014, corresponding with the increase in world manganese prices. The country's manganese output was exported to China owing to a lack of domestic demand. Malaysia's manganese resources were located in the States of Johor, Kelantan, Pahang, and Terengganu. In 2014, Sakura Ferroalloys Sdn Bhd, which was a joint venture of three companies—Assmang Proprietary Ltd. of South Africa (a manganese mining company), Sumitomo Corp. of Japan (a diversified trading company), and China Steel Corp. of China (a steel producer)—constructed a 163,000-t/yr ferromanganese plant at Sarawak. The ferromanganese plant was expected to commence production in 2016 (South East Asia Iron and Steel Institute, 2013; Stewart, 2015).

Tin.—In 2014, Malaysia produced about 3,800 t of tin concentrates compared with 3,700 t each in 2013 and 2012. The country imported 31,610 t of tin concentrates (from Indonesia) in 2014 compared with 30,273 t in 2013 and 26,537 t in 2012. Refined tin production was 35,018 t in 2014, compared with 32,633 t in 2013 and 37,823 t in 2012. Domestic tin consumption was 1,581 t in 2014 compared with 1,835 t in 2013 and 2,083 t in 2012. Malaysia exported 35,221 t of tin metal in 2014 compared with 36,363 t in 2013 and 37,212 t in 2012. Malaysia Smelting Corp. Bhd. (MSC) owned and operated the Butterworth tin refinery in Penang, which was Malaysia's sole tin refinery. MSC also owned a 40% share in Redring Solder Sdn Bhd, which manufactured solder products for jointing and semiconductor applications in the electrical and electronics industries. Solder was the leading tin-consuming sector in Malaysia, followed by tinplate and pewter producers; however, decreased demand from the solder and pewter sectors resulted in reduced domestic tin consumption (Malaysianminerals.com, 2015c; Malaysia Smelting Corp. Bhd., 2015).

Industrial Minerals

Cement.—Cement Industries of Malaysia Berhad (CIMA), Lafarge Malaysia Cement Bhd, and YTL Cement Bhd were the three major companies in Malaysia's cement sector. These companies accounted for about 78% of the country's total cement output capacity. CIMA had two plants and about 3 million metric tons per year (Mt/yr) of cement production capacity through its subsidiary Negeri Sembilan Cement Industries Sdn Bhd. Lafarge was Malaysia's leading cement producer with four plants and 14.7 Mt/yr of production capacity, representing 52.9% of the country's total integrated capacity. YTL Cement had two plants and 4.95 Mt/yr of production capacity. In 2014, Malaysia had 11 active integrated cement plants and 27.8 Mt/yr of cement production capacity. Cement manufacturer CMS Cement Sdn Bhd (a subsidiary of Cahya Mata Sarawak Bhd) planned to invest in its third cement-grinding plant, which would increase the company's total capacity to 2.75 Mt/yr by 2016 (table 2; Global Cement, 2014; Saunders, 2015).

Clay and Shale.—Malaysia had about 112 Mt of kaolin reserves, which were located in the States of Johore, Kelantan, Pahang, Perak, Sarawak, and Selangor. The active kaolin mines were operated mostly in the Bidor and Tapah Districts in Perak. Production of kaolin in 2013 (the latest year for which reported data were available) increased to 513,587 t from 438,923 t in 2012 (Malaysianminerals.com, 2015a).

Mineral Fuels and Related Materials

Coal.—In 2014, Malaysia produced about 2.7 Mt of coal, exported 31,201 t of coal, and imported about 2.1 Mt of coal. Coal demand increased during the past several years. The country's major coal consumers were cement plants, iron and steel plants, and powerplants. The country met its domestic demand by importing coal from Australia, China, and Indonesia. Malaysia's coal resources are located in the States of Perak, Perlis, Sabah, Sarawak, and Selangor. In 2014, five active coal mines employed 838 workers. Coal was produced from the areas of Bintulu, Merit-Pila, Silantek, and Tutoh in the State of Sarawak. The country had coal resources of about 1.7 billion metric tons (Gt), of which 274 Mt was measured, 347 Mt was indicated, and 1.1 Gt was inferred. About 80% of these resources are located in the State of Sarawak, 19% in the State of Sabah, and 1% in Peninsular Malaysia. Owing to the lack of infrastructure, most of the coal in the interior areas of the country had not been exploited. The Sabah coal resource was located in the Maliau Basin Conservation Area, which the Government had designated as a protected area. Mining and exploration for coal were conducted only in Sarawak (Monthly Statistical Bulletin, 2015; Malaysianminerals.com, 2015a, Saunders, 2015).

Natural Gas and Petroleum.—In 2014, Petronas owned and operated three refineries in Malaysia—Petronas Penapisan (Melaka) Sdn Bhd (PP[M]SB) and the Malaysian Refining Co. (MRC), which were both located in Melaka, and Petronas Penapisan (Terengganu) Sdn Bhd (PP[T]SB), which was located in Terengganu. Crude oil produced offshore of the States of Sarawak and Terengganu was refined into petroleum products by PP[M]SB and PP[T]SB for domestic consumption and export. The two plants had the capacity to refine 130,000 and 124,000 barrels per day (bbl/d), respectively. The MRC had the capacity to refine 170,000 bbl/d. The company acquired crude oil mainly from countries in the Middle East. Petronas also owned the Engen Refinery (Enref) in Durban, South Africa, through a majority shareholding in Engen Petroleum Ltd. The refinery had the capacity to refine 135,000 bbl/d of crude oil (Petroliam Nasional Berhad, 2015, p. 7–8).

Outlook

Malaysia's increasing private and public investment and spending will likely continue to support the country's economic growth. The Government is expected to continue to encourage domestic minerals production and mineral commodity exports. It is likely to continue to promote investment opportunities to provide a more competitive economic environment. The Tenth Malaysia Plan promotes production increases in the cement and the iron and steel sectors. Exports of bauxite to China are expected to increase in the near future.

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TABLE 1
MALAYSIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
METALS						
Aluminum:						
Bauxite, gross weight		124,474 [r]	182,931 [r]	121,873	208,770 [r]	3,258,000
Aluminum		--	--	120,000 [e]	290,772	--
Gold, mine output, Au content[3]	kilograms	3,766 [r]	4,219	4,625	3,823 [r]	4,038
Iron and steel:						
Iron ore:						
Gross weight	thousand metric tons	3,558 [r]	8,078	10,886 [r]	12,134 [r]	9,615
Fe content[e]	do.	1,970	4,600	6,900	6,900	6,000
Pig iron, direct-reduced iron, and hot-briquetted iron	do.	2,390	2,876	2,329	1,399	2,400
Steel, crude	do.	5,693	5,941	5,612	4,693	4,316
Magnesium metal[e]		--	200	5,000	5,000	5,000
Manganese, gross weight		899,703	597,917	1,099,585	1,045,412 [r]	1,000,000 [e]
Niobium (columbium)-tantalum metals, struverite, gross weight		84	110	262	190	190 [e]
Silver, mine output, Ag content[3]	kilograms	436	459	1,628	361	360 [e]
Tin:						
Mine output, Sn content		2,668	3,340	3,725 [r]	3,697	3,777
Metal, refined		38,771 [r]	40,281 [r]	37,823 [r]	32,633 [r]	35,018
Titanium:						
Ilmenite concentrate, gross weight		19,039 [r]	28,782	22,275	16,043	8,159
Rutile		7,567	10,810	20,008	5,983	6,000 [e]
Zirconium, zircon concentrate, gross weight		1,267	1,685	442	379	380 [e]
INDUSTRIAL MINERALS						
Barite		1,000	--	--	500 [r]	--
Cement, hydraulic	thousand metric tons	19,762	21,198	21,726	21,457	21,700
Clays	do.	27,543	28,384	30,690	28,045	31,000
Feldspar		455,497	379,628	482,906	348,112 [r]	350,000 [e]
Kaolin		530,331	442,500	438,923	513,587 [r]	300,000
Mica		4,515	4,245	3,967	4,242 [r]	4,000
Rare earths, monazite and xeonotime, gross weight		732	779	179	358	946
Sand and gravel	thousand metric tons	30,678	37,339	28,592	29,000 [r]	30,000 [e]
Silica sand		932,159	1,340,013	931,880	394,163 [r]	400,000 [e]
Stone:						
Aggregate	thousand metric tons	101,809	118,510	110,339	100,000 [e]	100,000 [e]
Dolomite[e]		50,900	50,000	50,000	50,000	50,000
Limestone	thousand metric tons	32,398	34,300	36,580	24,000 [r]	24,000 [e]
MINERAL FUELS AND RELATED MATERIALS						
Coal	thousand metric tons	2,397	2,916	2,942	2,907 [r]	2,688
Gas, natural:[e]						
Gross	million cubic meters	72,000	73,000	74,000	74,000	74,000
Net[4]	do.	61,136	61,400	62,000	62,000	62,000
Liquefied natural gas	thousand metric tons	24,363	25,822	23,986	25,957	26,000
Petroleum:						
Crude and condensate	thousand 42-gallon barrels	232,100	207,696	214,317	208,141	210,000 [e]
Refinery products[e]	do.	210,000	215,000	215,000	215,000	215,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. -- Zero.

[1] Table includes reported data available through November 27, 2015.

[2] In addition to the commodities listed, a variety of materials, including ammonia, copper, fertilizers, lead (secondary), and salt, were produced but not reported, and available information was inadequate to make reliable estimates of output.

[3] Includes byproduct from tin mines in Peninsular Malaysia and gold mines in Peninsular Malaysia and the State of Sarawak.

[4] Includes production from Peninsular Malaysia and the States of Sabah and Sarawak.

Sources: Ministry of Primary Industry, Minerals and Geoscience Department (Kuala Lumpur), Malaysian Minerals Yearbook 2012, and World Steel Association, Steel Statistical Yearbook 2015.

TABLE 2
MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum, metal		Press Metal Sarawak Sdn Bhd (Press Metal Berhad)	Mukah, Sarawak	120.
Do.		do.	Similaijau, Sarawak	320.
Bauxite		5 enterprises, as follows:	Locations:	15,300.[e]
		Johore Mining and Stevedoring Co. Sdn Bhd	Teluk Rumania and Sg. Rengit, Johor	
		Golden Prosperous	NA	
		Good Man Venture	NA	
		Top International Holding	NA	
		Seng Hiap Metal	NA	
Cement[1]		Cement Industries of Malaysia Berhad (CIMA) (United Engineers Malaysia Group Berhad., 53.97%, and others, 46.03%)	Kangar, Perlis	2,000 cement; 1,650 clinker.
Do.		do.	Bahau, Negeri Sembilan	1,580 cement; 1,300 clinker.
Do.		CMS Cement Sdn Bhd (a subsidiary of Cahya Mata Sarawak Bhd)	Bintulu, Sarawak	750 cement.
Do.		do.	Kuching, Sarawak	1,000 cement.
Do.		Holcim (Malaysia) Sdn Bhd (Holcim Ltd.)	Pasir Gudang, Johor	1,300 cement.
Do.		Lafarge Malaysia Cement Bhd. (a subsidiary of Lafarge S.A.)	Rawang, Selangor, Langkawi, Kedah	6,810 cement; 4,900 clinker.
Do.		do.	do.	5,370 cement; 3,300 clinker.
Do.		do.	Pasir Gudang, Johor	770 cement.
Do.		YTL Cement Berhad (a subsidiary of YTL Group)	Bukit Sagu, Pahang	1,300 cement; 1,200 clinker.
Do.		do.	Padang Rengas, Perak	3,400 cement; 3,000 clinker.
Do.		do.	Pasir Gudang and Westport, Johor	1,000 cement.
Do.		Tasek Corp. Bhd (publicly owned company)	Ipoh, Perak	2,300 cement; 2,300 clinker.
Coal, mine		Kuala Lumpur, Raub, and Kuching	Multiple mines in Sarawak	2,700.
Copper, mine		Monument Mengapur Sdn Bhd (a subsidiary of Monument Mining Ltd.)	Sri Jaya, Pahang	NA.
Gas:				
Natural	million cubic meters per day	ExxonMobil Exploration and Production Malaysia, Inc.	Offshore Terengganu	45.
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	3.
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	80.
Liquefied		Malaysia LNG Sdn. Bhd. [Petroliam Nasional Berhad (Petronas), 65%; Shell Gas N.V., 15%; Mitsubishi Corp., 15%; Sarawak State government, 5%]	Tanjung Kidurong, Bintulu, Sarawak	8,100.
Do.		Malaysia LNG Dua Sdn. Bhd. [Petroliam Nasional Berhad (Petronas), 60%; Shell Gas N.V., 15%; Mitsubishi Corp., 15%; Sarawak State government, 10%]	do.	7,800.
Do.		Malaysia LNG Tiga Sdn. Bhd. [Petroliam Nasional Berhad (Petronas) 60%; Shell Gas N.V., 15%; Nippon Oil LNG (Netherlands) BV, 10%; Sarawak State government, 10%; Diamond Gas Netherlands BV, 5%]	do.	6,800.
Gold, refined	kilograms	PT J Resources Asia Pasifik Tbk (J&Partners, L.P., 100%)	Penjom, Pahang	4,000.
Do.	do.	Raub Australian Gold Mining Sdn. Bhd (Peninsular Gold Ltd., 100%)	Raub, Pahang	500.
Do.	do.	Monument Mining Ltd. of Canada	Bukit Selinsing Koyan, Pahang	1,500.
Do.		Avocet Mining plc	Penjom, Pahang	NA.
Iron and steel:				
Iron ore		CAA Resources Ltd. of China	Bukit Ibam, Pahang	NA.
Do.		Monument Mining Ltd. of Canada	Sri Jaya, Pahang	NA.
Direct-reduced iron		Lion DRI Sdn Bhd (The Lion Group)	Banting, Selangor	1,540.
Do.		Perwaja Steel Sdn. Bhd. (Kinsteel Bhd, 51%, and Maju Holdings Sdn. Bhd., 49%)	Kemaman, Terengganu	1,800.

See footnotes at end of table.

TABLE 2—Continued
MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron and steel—Continued:			
Hot-briquetted iron	Amsteel Mills Sdn Bhd (The Lion Group)	Labuan Island, offshore Sabah	880.
Crude steel	do.	Banting, Selangor	1,250.
Do.	do.	Klang, Selangor	750.
Do.	Ann Joo Steel Bhd (Ann Joo Group)	Prai, Penang	900.
Do.	Antara Steel Sdn. Bhd. (The Lion Grop)	Pasir Gudang, Johr	600.
Do.	Kinsteel Sdn Bhd	Kuantan, Pahang	500.
Do.	Megasteel Sdn Bhd (The Lion Group)	Banting, Selangor	700.
Do.	Malaysia Steel Works Bhd	Bukit Raja, Selangor	450.
Do.	Perwaja Steel Sdn Bhd (Kinsteel Bhd, 51%, and Maju Holdings Sdn Bhd, 49%)	Kermaman, Terengganu	1,500.
Do.	Southern Steel Bhd. [Camerlin (a member of Hong Leong Group Malaysia), 40.75%; Natsteel Ltd., 27.03; others, 32.22%]	Prai, Penang	1,300.
Kaolin	Tasek Corp.	Perak	520.
Magnesium, metal	CVM Minerals Ltd.	Kamunting Raya, Perak	NA.
Nitrogen, ammonia	Asean Bintulu Fertilizer Sdn. Bhd. (Petroliam Nasional Berhad (Petronas) 63.5%; P.T. Pupuk Sriwidjaja Indonesia, 13%; Thai Ministry of Finance, 13%; Philippines National Development Co., 9.5%; Singapore Temasek Holdings Pte. Ltd., 1%)	Bintulu, Sarawak	395.
Do.	Petronas Fertilizer Kedah Sdn Bhd [a wholly owned subsidiary of Petroliam Nasional Berhad (Petronas)]	Gurun, Kedah	378.
Do.	Petronas Ammonia Sdn. Bhd. (a wholly owned subsidiary of Petroliam Nasional Berhad)	Kerth, Terengganu	370.
Petroleum, crude thousand 42-gallon barrels per day	ExxonMobil Exploration and Production Malaysia, Inc.	Offshore Terengganu	390.
Do. do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	100.
Do. do.	Sarawak Shell Bhd.	Offshore Sarawak	184.
Do. do.	Malaysian Refining Company (MRC)	Melaka	170.
Do. do.	Penapisan (Melaka) Sdn Bhd (PP(M)SB)	do.	130.
Do. do.	Petronas Penapisan (Terengganu) Sdn Bhd (PP(T)SB)	Terengganu	124.
Do. do.	Petronas Carigali Sdn Bhd	Offshore Terengganu	22.
Do. do.	Murphy Sarawak Oil Co. Ltd.	Offshore Sarawak	15.
Rare earths (REO equivalent), rare-earth compounds	Lynas Corp. Ltd. of Australia	Kuantan, Pahang	11.
Tin:			
Concentrate	Delima Industries Sdn Bhd	Dengkil, Selangor	1,100.
Do.	Maiju Sama Sdn Bhd	Puchong, Selangor	1,600.
Do.	New Lahat Mines Sdn. Bhd.	Lahat, Perak	300.
Do.	Omsam Telecommunication Sdn Bhd	Bakap and Batu Gajah, Perak	500.
Do.	Rahman Hydraulic Tin Bhd.	Klian Intan, Perak	3,000.
Do.	S.E.K. (M) Sdn Bhd	Kampar, Perak	400.
Do.	Tasek Abadi Sdn Bhd.	Senudong and Kampar, Perak	500.
Refined	Malaysia Smelting Corp. Bhd. (The Straits Trading Co. Ltd., 37.44%; Malaysia Mining Corp., 37.44%; others, 25.12%)	Butterworth, Penang	40.
Titanium dioxide	Huntsman Trioxide Sdn Bhd (a subsidiary of Huntsman Trioxide)	Kemaman, Terengganu	56.

[e] Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not avaialable.

[1] All companies operated integrated plants.

THE MINERAL INDUSTRIES OF MONGOLIA

By Sean Xun

Mongolia is a landlocked country located between China and Russia. The vast territory of Mongolia has rich mineral deposits, including copper, coal, gold, and uranium. The mineral sector plays an important role in the country's economy. The Oyu Tolgoi copper mine and the Tavan Tolgoi coal mine are Mongolia's world-class mining projects under development. In 2014, mineral materials produced in Mongolia included cement, coal, copper, crude oil, fluorspar, molybdenum, and silver (table 1).

Minerals in the National Economy

According to the National Statistical Office of Mongolia, preliminary estimates of the 2014 real gross domestic product (GDP) indicated an increase of 7.8% compared with that of 2013; the rate of growth in 2014 was lower than that of 2013 (11.6%). Growth in the mining sector, which contributed 17.6% of the GDP in 2014, remained robust, expanding by 19.1% compared with that of 2013; the rate of growth of the mineral sector in 2013 was 18.5%. Strong mine production overall was attributed to increased copper production at the new Oyu Tolgoi (OT) Mine despite the decrease in coal production owing to the decline in coal prices. Growth in the nonmining sectors, however, registered lower rates in 2014 owing to contraction in the construction and the wholesale and retail sectors. The agriculture, forestry, and fishing sector, which contributed 14% to the GDP, expanded by 13.7% in 2014 compared with 19.2% in 2013, and the manufacturing sector, which contributed 10.6% to the GDP, expanded by 4.6% in 2014 compared with 10.3% in 2013 (World Bank, The, 2014, p. 7; National Statistical Office of Mongolia, 2015b).

In 2014, 71,565 people were employed by the country's industrial sector compared with 73,014 in 2013. The mining and quarrying sector employed 25,263 people in 2014 compared with 26,705 in 2013; 12,457 were engaged in the mining of metal ores compared with 13,197 in 2013, 8,247 were engaged in the mining of coal and lignite and the extraction of peat compared with 8,384 in 2013, 2,798 were engaged in the extraction of crude petroleum compared with 2,712 in 2013, and 1,761 were engaged in other unspecified mining and quarrying compared with 2,412 in 2013 (National Statistical Office of Mongolia, 2015a, p. 18).

From 2010 to 2012, total investment in the country increased by an average of 38% annually and was a primary driver of economic growth, and foreign direct investment was a major source of financing for investment. Total investment, however, decreased by 35.4% in 2013 compared with that of 2012, followed by a more significant decrease of 73.6% in 2014. The sharp decreases were owing to the completion of the Oyu Tolgoi Mine in 2012. In 2014, investment in the mining and quarrying sector accounted for 14% of the country's total investment compared with 46% in 2013 and 50% in 2012 (World Bank, The, 2014, p. 8; National Statistical Office of Mongolia, 2015a, p. 8).

Government Policies and Programs

The Mineral Resources Authority of Mongolia is the Government agency that oversees the mining sector, provides assistance and support in developing the state's policy for the mining industry, provides services to businesses and investors, and implements the Minerals Law and related legislation (Mineral Resources Authority of Mongolia, 2015).

On January 16, a new State Minerals Policy (the Minerals Policy) was adopted by the Mongolian Parliament. The purpose of this policy is to improve the stability of the investment environment; to improve the quality of mineral exploration, mining, and processing; to promote advanced technology; and to make the mining sector more competitive on the international market. The Government expected that implementation of this policy would lead to more openness and transparency of state organizations and state-owned companies. Plans for gradual privatization of state-owned companies in the mining sector were outlined in the policy. The Minerals Policy was expected to serve as the basis for amendments to the existing Minerals Law and other laws relating to the mining sector (Allens, 2014a).

On July 1, amendments to the Minerals Law of Mongolia (the Amendments) and several new laws relating to the mining sector were passed by the Mongolian Parliament. One of the laws lifted the ban on the issuance of new exploration licenses, which had been in place since 2010, and was intended to encourage investment and exploration activity in the country. The Amendments proposed the establishment of a National Geology Office to collect and maintain mining-related information in support of the development of Mongolia's mining sector (Allens, 2014b).

On July 1, a revised version of the Law of Mongolia on Petroleum (the Petroleum Law) was adopted by the Parliament of Mongolia. The Petroleum Law replaced the previous petroleum law, which was enacted in 1991, and identified just three types of petroleum-related activities—research, exploration, and extraction—while the old law had seven categories—exploration, preservation, production, processing, transportation, storage, and trade. In addition to simplifying the categories, the licensing procedure was also modified to reduce complexity. Obtaining a license is a more complicated process than obtaining permission, and is required for exploration and extraction activities for oil and unconventional oil. For such activities as research, storage, and transportation, the Government only requires operators to obtain permission, which is a simple approval process. The revised Petroleum Law represents another positive measure adopted by the Government to attract more foreign and domestic investment in the petroleum sector. In addition, in 2013 the Parliament adopted the Law of Mongolia on Investment, which became effective on July 20, 2014, and was also intended to encourage investment in the mining sector (Woolley and Odkhuu, 2014).

Production

In 2014, cement production increased by 59% compared with that of 2013 owing to operations resuming at the country's largest cement plant, the Khutul plant, which had been refurbished over a 1.5-year period. Fluorspar production increased by 65%; crude petroleum, by 44%; copper (mine output), by 34% owing to the first full year of operation at the Oyu Tolgoi Mine; silver (mine output), by 34%; gold (mine output), by 29%; crude steel, by 15%; and molybdenum (mine output), by 10%. Production of coal, decreased by 16% compared with that of 2013 owing to decreased demand from China. Production of salt (mine output) decreased by 15%, and that of zinc (mine output) decreased by 10% (table 1; National Statistical Office of Mongolia, 2015a, p. 118–119).

Structure of the Mineral Industry

Table 2 is a list of the major mineral industry facilities operating in Mongolia in 2014. The locations and production capacities of these facilities are also provided. Most of the producing mining companies in Mongolia were owned jointly by private international companies and the Mongolian Government, whereas some were state owned and some were wholly owned by foreign investors.

Mineral Trade

In 2014, the total value of trade was about $11 billion with a trade surplus of $537.9 million. In comparison, the total value of trade in 2013 was $10.6 billion with a deficit of about $2 billion. Exports were valued at $5.77 billion in 2014, representing a 35% increase compared with that of 2013; imports were valued at $5.24 billion, representing an 18% decrease compared with that of 2013. China was the leading recipient of Mongolia's exports in terms of value, accounting for about $5.07 billion compared with $3.71 billion in 2013; the United Kingdom followed, accounting for $399 million, and Russia accounted for $61.7 million (National Statistical Office of Mongolia, 2015a, p. 57–58).

The country's increase in exports was largely accounted for by the increase in mineral exports. In 2014, the value of exported mineral products amounted to $4.79 billion compared with $3.5 billion in 2013 owing to the increased production at the Oyu Tolgoi copper mine. About 1.38 million metric tons (Mt) of copper concentrate (gross weight), which was valued at about $2.57 billion, was exported in 2014 compared with about 650,000 metric tons (t) valued at $949 million in 2013. Other notable mineral exports in 2014 included 19.5 Mt of coal valued at about $849 million compared with about 18.4 Mt valued at $1.12 billion in 2013, 6.88 million barrels (Mbbl) of crude petroleum oil valued at $635 million compared with 5.2 Mbbl valued at $515 million in 2013, 6.3 Mt of iron ore valued at about $446 million compared with about 6.7 Mt valued at $654 million in 2013, 10,000 kilograms (kg) of gold (unwrought or in semimanufactured forms) valued at $405 million compared with 7,600 kg valued at $310 million in 2013, 99,400 t of zinc concentrate valued at $113 million compared with 130,900 t valued at $120 million in 2013, 313,900 t of fluorspar ores and concentrates valued at $71.5 million compared with 338,100 t valued at $83.2 million in 2013, 6,327 t of refined copper and copper alloy valued at $41.9 million compared with 2,201 t valued at $16.1 million in 2013, and about 4,000 t of molybdenum ore and concentrate valued at $35.7 million compared with about 4,000 t valued at $29.5 million in 2013 (National Statistical Office of Mongolia, 2015a, p. 57–61).

In 2014, China received 100% of Mongolia's exports of coal, copper concentrate, iron ore, and zinc ores and concentrate; 74% of molybdenum ores and concentrate; and 46% of fluorspar ores and concentrate. The remainder of the exports of fluorspar ores and concentrate mainly went to Russia (52%), and the remainder of the exports of the molybdenum ores and concentrate mainly went to the Republic of Korea (22%). The leading import partners and their share of Mongolia's mineral exports remained unchanged from 2013 to 2014 (National Statistical Office of Mongolia, 2015a, p. 60).

Imports to Mongolia were provided by a few countries. In 2014, China provided 34% of Mongolia's imported goods in terms of value; Russia, 30%; Japan, 7%; and the United States, 4%. The value of imported mineral products amounted to $1.46 billion, or 28% of total imports. The leading imported mineral products were fuel and cement, which were valued at $1.1 billion and $91.6 million, respectively, in 2014 compared with $1.37 billion and $97.8 million, respectively, in 2013 (National Statistical Office of Mongolia, 2015a, p. 62–66).

Commodity Review

Metals

Copper and Gold.—On January 24, 2012, Rio Tinto plc obtained a controlling interest in Turquoise Hill Resources Ltd., which held a 66% interest in Oyu Tolgoi LLC (OT). The Oyu Tolgoi copper and gold mine is located in the South Gobi region and was being developed by OT. At the end of 2014, Rio Tinto had a 50.79% interest in Turquoise Hill and, therefore, a 33.5% indirect interest in the Oyu Tolgoi project. The remaining 34% of the Oyu Tolgoi project was held by the Government. Rio Tinto was responsible for the management of the development process of the Oyu Tolgoi Mine. OT held three mining licenses that covered the majority of the identified mineralization at the Hugo Dummett and the Southern Oyu Tolgoi (SOT) deposits. The company also held two additional licenses in joint venture with Entree Gold LLC. Under the Minerals Law of Mongolia, the licenses were valid for 30 years with the possibility of two 20-year extensions. The first renewal was due in 2033 for the Oyu Tolgoi licenses and in 2039 for the Entree Gold licenses (Rio Tinto plc, 2015, p. 158, 212; Turquoise Hill Resources Ltd., 2015, p. 20, 58, 63).

In 2010, an initial investment decision was made to construct the SOT open pit mine with a nominal 100,000-metric-ton-per-day (t/d)-concentrator and supporting infrastructure. The mine entered commercial production in September 2013, and the first concentrate was exported in October 2013. In 2014, which was the first full year of operation, OT produced 148,400 t of copper compared with 76,700 t in 2013, 18,311 kg of gold compared with 4,883 kg in 2013, and 27,775 kg of silver compared with 15,209 kg in 2013. In 2014, OT sold about 733,700 t of concentrate and generated about $1.6 billion in net revenue.

According to the company, the recovery rate improved in 2014 owing to operational improvements throughout the year and the development of a high-grade zone in the second half of the year. Concentrate inventories were drawn down to normal levels by the end of 2014 owing to improvements in marketing and logistics in 2014 (Rio Tinto plc, 2015, p. 197; Turquoise Hill Resources Ltd., 2015, p. 19, 59).

As of yearend 2014, the proved ore reserves at the Oyu Tolgoi operating mines were 383 Mt grading 0.54% copper, 0.39 gram per ton (g/t) gold, and 1.41 g/t silver; probable ore reserves were 612 Mt grading 0.40% copper, 0.23 g/t gold, and 1.12 g/t silver. The probable ore reserves at the Hugo Dummett North deposit (one of the Oyu Tolgoi development projects) were 464 Mt grading 1.66% copper, 0.34 g/t gold, and 3.37 g/t silver. The total resources at the Oyu Tolgoi deposits were about 4.9 Mt grading 0.39% to 1.19% copper, 0.07 g/t to 0.44 g/t gold, and 0.91 g/t to 3.18 g/t silver. Inferred molybdenum resources were about 1.817 billion metric tons grading 0.011% molybdenum (Rio Tinto plc, 2015, p. 200–201, 205, 207).

The Hugo North underground mine was the most significant economic component for the initial investment decision at the Oyu Tolgoi Mine. In August 2013, however, the development of the underground mine was delayed owing to unresolved matters with the Government of Mongolia. The issues included agreement on a comprehensive funding plan, completion and approval of the feasibility study by all shareholders and acceptance of the study by the Mongolian Minerals Council, and issuance of all necessary permits required for operations and development. In February 2014, Turquoise Hill Resources Ltd., Rio Tinto, and the Government announced that they were committed to continue construction of the underground mine and to develop the Oyu Tolgoi subject to resolution of the unresolved issues (Rio Tinto plc, 2015, p. 31; Turquoise Hill Resources Ltd., 2015, p. 17, 59–60).

China supplied power to the Oyu Tolgoi Mine, which is located less than 100 kilometers (km) from the China border, from its power grid and a supplementary diesel power generation site. In August 2014, OT and the Government entered into a Power Sector Cooperation Agreement to explore the possibility of establishing an independent power producer. Under the agreement, the Government would import and supply power to meet OT's needs until Mongolia developed a domestic power source. A long-term framework for strategic cooperation aimed at a comprehensive energy solution for the South Gobi region was outlined in the agreement (Rio Tinto plc, 2015, p. 213; Turquoise Hill Resources Ltd., 2015, p. 36).

Industrial Minerals

Cement.—Cement consumption in Mongolia in 2014 was reported to be about 2 Mt, and consumption for 2015 was projected to be 3 Mt. The increased demand was in part owing to high levels of investment in mining and infrastructure in recent years. Mongolia produced 411,000 t of cement in 2014 and 259,000 t in 2013. The shortfall in production had been met by imports, mostly from China. About 1.5 Mt of cement was imported in 2014 (Oxford Business Group, 2014b; National Statistical Office of Mongolia, 2015a, p. 8, 119).

In May, the Khutul plant (owned by Khutul Cement and Lime JSC) began production after a 1.5-year period of refurbishment in which outdated technology from an inactive Soviet-era cement factory was replaced with a modern dry-process system. The plant was located 250 km north of Ulaanbaatar and had a 1-Mt capacity. The updated plant was expected to reduce power consumption and pollution. The plant was expected to meet about 50% of the nation's annual cement consumption (Oxford Business Group, 2014b).

In May 2013, the European Bank for Reconstruction and Development (EBRD) obtained a stake in Senj Sant, a company owned by Monpolymet Group, through an equity investment of $20 million. In late April 2014, the EBRD agreed to lend Senj Sant $65 million to fund the construction, commissioning, and operation of a new cement plant. The new Senj Sant plant was strategically located in southern Mongolia about 450 km from the capital, Ulaanbaatar, and was expected to have a total capacity of about 3,000 t/d of cement. The plant, which was expected to start production in 2015, would employ a technologically advanced, environmentally friendly dry-process to produce high-quality cement. According to Monpolymet Group, the EBRD's financing was expected to help Senj Sant raise its business standards to international levels and diversify the economy by targeting an industry that was relatively underdeveloped locally (Oxford Business Group, 2014b; Pyrkalo, 2014).

Mineral Fuels and Related Materials

Coal.—In 2014, Mongolia produced 24.4 Mt of coal compared with 29.2 Mt in 2013. The majority of the production was exported to China, where the effects of economic deceleration and the oversupply of coal became more acute in the second half of 2014. As a result, Mongolia's exports of coal to China decreased by 23.7% in the second half of 2014 compared with the 26.2% year-on-year increase reported in the first half of 2014. In 2014, China imported 14.8 Mt of coking coal from Mongolia compared with 15.4 Mt on 2013, owing to the deceleration in the rate of growth of crude steel production in the country (Mongolia Mining Corp., 2015, p. 19, 22, 23).

Mongolia Mining Corp. was a leading coal producer in Mongolia. The company was the only major producer and exporter of washed coal and accounted for approximately 28% of the country's total coal exports. As of yearend 2014, the company held three mining licenses. The UHG mining license covered 29.6 square kilometers (km^2) across the Ukhaa Khudag coal deposit, which had 700 Mt of resources (360 Mt measured, 220 Mt indicated, and 120 Mt inferred) and 315 Mt of reserves (218 Mt proved and 97 Mt probable). The BN mining license covered 44.82 km^2 across the Baruun Naran deposit, which had 280 Mt of resources (210 Mt measured and 70 Mt indicated) and 165 Mt of reserves (141 Mt proved and 24 Mt probable). The THG mining license covered 83.4 km^2 across the Tsaikhar Khudag coal deposit, which had 50 Mt of inferred resources. In 2014, coal production for Mongolia Mining was 4.6 Mt compared with about 9.7 Mt in 2013. About 4.9 Mt of coal was processed and 2.4 Mt of coking coal primary product was produced (Mongolia Mining Corp., 2015, p. 26–33).

Guildford Coal Ltd. (Guildford) of Australia operated the Baruun Noyon Uul coal mine through the company's wholly owned subsidiary Terra Energy LLC. In February 2014, the company announced the formal commissioning of the mine in South Gobi and its subsequent approval for operations and sales by the Mongolian Government. In August 2014, Terra Energy shipped 8,000 t of coking coal to China. In the last quarter of 2014, the Government of Mongolia formally approved an increase in the allowable mining capacity to 1.5 Mt in 2015 and 2.0 Mt in 2016. Guildford expected that the Baruun Noyon Uul Mine would enter full-scale production in 2015. At the end of 2014, Guildford Coal had total resources of 289 Mt (15 Mt measured, 41 Mt indicated, and 233 Mt inferred) in Mongolia (Guildford Coal Ltd., 2015a, p. 5–6; 2015b).

In August, Mongolia Mining Corp., through its subsidiary Energy Resources, formed and led a consortium with China Shenhua Energy Company Ltd. and Sumitomo Corp., to bid for the right to develop the Tavan Tolgoi coal mine, which is located about 240 km north of the China border. On December 23, the Government announced that the consortium was selected to develop the mine rather than Peabody Energy Corp. of the United States. The formal negotiation process would start in early January 2015. The consortium was expected to produce 30 million metric tons per year (Mt/yr) of coal at Tavan Tolgoi, to deliver coal to at least two export markets, and to become a leading global producer in the coking coal industry. Mongolia's Government would retain full ownership of the Tavan Tolgoi deposit, which was estimated to have 7.4 billion metric tons of coal reserves (Kohn, 2014; Mongolia Mining Corp., 2015, p. 37).

Petroleum and Natural Gas.—Mongolia produced 7.4 Mbbl of crude oil in 2014 compared with 5.1 Mbbl in 2013. The country had produced and refined oil domestically before the 1960s but had no production since then. PetroChina Company Ltd. (a subsidiary of China National Petroleum Corp.) and Sinopec Ltd. (also known as China Petroleum & Chemical Corp.) of China started producing oil in Mongolia in 2005, and production increased significantly in recent years. According to the Petroleum Authority of Mongolia, 16 companies were conducting petroleum exploration activities in Mongolia in 2014, including PetroChina Daching Tamsag-Mongolia LLC (China), Dong Sheng Petroleum Mongolia LLC (China), Petro Matad LLC (Mongolia), Shaman Resources LLC (Canada), and Gobi Energy Partners LLC (Switzerland) (Forster, 2014; Petroleum Authority of Mongolia, 2015).

Genie Oil Shale Mongolia LLC (GOSM), a subsidiary of Genie Oil and Gas of the United States, explored for unconventional sources oil and gas in Mongolia. On September 16, GOSM signed an agreement with the Government to explore a new block covering 25,000 km^2 in Central Mongolia, southeast of Ulaanbaatar. Under the agreement, the company could request a commercial production agreement once a specific suitable resource and a location were identified. Combined with previously signed exploratory agreements, GOSM held exclusive rights to explore for oil shale in a total area of about 60,000 km^2 in Mongolia. According to GOSM, analysis of the available geologic evidence suggested that the exploration area could contain world-class deposits of thick, rich oil shale that was well suited for GOSM's extraction technology (Genie Energy Ltd., 2014a, b).

Wolf Petroleum of Australia conducted exploration for, operation of, and development of oil and gas in Mongolia. The company held an exploration area of 74,400 km^2, which was the largest area held by any petroleum company in Mongolia. The company's wholly owned SB block, which is located in eastern Mongolia and is close to the China border and existing infrastructure, was its most advanced project and was at the drill-ready stage. According to Wolf, the block had the potential to hold between 462 Mbbl and 2,200 Mbbl of recoverable oil. In 2014, the company continued to look for potential industry and financial partners to advance the development of the block (Forster, 2014; Wolf Petroleum, 2015).

In 2011, Sod Mongol Group announced that it would start building a petroleum refinery with a 1.5-Mt/yr capacity. Construction had not begun as of yearend 2014. Mongolia, in 2014, exported $635 million worth of crude petroleum oil and imported $1.1 billion worth of refined products. As petroleum production and exploration activities continued to increase in the country, the Government of Mongolia was considering the possibility of building a petroleum refinery (Narantuya, 2014; National Statistical Office of Mongolia, 2015a, p. 61, 66).

Uranium.—As of January 1, 2013, recoverable uranium resources in Mongolia were estimated to be 142,000 t of uranium, which are ranked 5th worldwide on a cost base of less than $80 per kilogram of uranium and 13th on a cost base of less than $260 per kilogram of uranium. The resource increased compared with that of January 1, 2011, owing to increased resources at the Gurvansaikhan, Ulziit, Zoovch Ovoo sandstone-type deposits located in the Gurvansaikhan basin, Ulziit basin, and Zuunbayan basin of southeastern Mongolia. From 1988 to 1995, the Soviets extracted uranium from an underground mine at the Mardai deposit in eastern Mongolia; there has been no uranium production in Mongolia since the Soviets left the mine in 1995. In 2014, companies from China, France, Russia, and the United States had begun developing uranium projects in Mongolia (Pressenza Hong Kong, 2014; Organization for Economic Co-operation and Development Nuclear Energy Agency, 2014, p. 23, 313, 314).

On October 26, 2013, a joint venture, AREVA Mines LLC, was formed by AREVA S.A. of France (66%) and state-owned MON-ATOM (34%) to develop uranium mines in Mongolia. Under a separate agreement, Mitsubishi Corp. of Japan took an equity interest in the joint venture. AREVA had been carrying out exploration work in Mongolia since 1997 and had discovered two uranium deposits in the Provinces of Dornogobi, Dulaan Uul, and Zoovch Ovoo. The ore grade at the Zoovch Ovoo deposit was 0.022% uranium, and the total uranium content was 67,706 t; the ore grade at the Dulaan Uul deposit was 0.022% uranium, and the uranium content was 6,259 t. According to the company's plan, AREVA Mines would produce 2,000 to 3,000 metric tons per year of uranium, or about 5% of global output. In May, AREVA Mines released an open letter to organizations that oppose AREVA's uranium mining in Mongolia. The purpose of the letter was to address the public's concerns about the environmental and health effects of uranium mining. In the letter, AREVA Mines stated that the company respected the law of Mongolia and would not engage in any activity that was harmful to the environment, local citizens' health, or animal health. In June, during a peaceful demonstration, several nongovernmental organizations expressed their opposition to uranium mining in Mongolia, citing the fatal effects of uranium mining in Ulaanbadrakh soum (AREVA S.A., 2013; AREVA Mongol LLC, 2014; Organization for Economic Co-operation and Development Nuclear Energy Agency, 2014, p. 20; Oxford Business Group, 2014a).

Outlook

In its December 2014 Mongolia Economic Update, the World Bank projected that the growth of Mongolia's GDP in 2015 would be 6.1% and the mining sector's GDP would increase by 11.3%. Long-term economic prospects remain strong despite the challenges from persistent large economic imbalances caused by the decrease in foreign direct investment inflows and the weakness of the global minerals market. In the short term, decreasing demand for Mongolia's major commodities, such as copper and coal, is expected owing to reduced economic growth in China, which was a major export partner (World Bank, The, 2014, p. 37).

The mining sector is expected to continue to play a significant role in Mongolia's economy. The increase in the mining sector in 2014, which was attributed to the first full year of production at the OT Mine, is expected to moderate in 2015. Foreign direct investment in mining may increase in the short term if the plan to develop the OT underground mine is approved. Coal mining companies will likely continue to face significant challenges from deteriorating market conditions. The development consortium for the Tavan Tolgoi coal deposit is likely to become a leading global producer of coking coal. Development of the project, however, is not expected in the short term considering the policy uncertainty as well as the unfavorable market conditions. The intensive activities in petroleum and uranium exploration may expand production capacity for these strategic resources. Cement production is expected to increase in 2015, and the country may become self-sufficient in the coming years.

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TABLE 1

MONGOLIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
Cement, hydraulic	thousand metric tons	323	426	349	259 [r]	411
Coal, unspecified	do.	25,246	30,940	28,561 [r]	29,164 [r]	24,415
Copper:						
Mine output, Cu content		124,985	121,590	121,660	186,655	249,200
Metal, refined		2,746	2,390	2,282	2,344 [r]	2,132
Fluorspar:						
Acid grade	thousand metric tons	141	116	157	76	128
Submetallurgical and other grade	do.	259	232	484	150	247
Total	do.	400	348	641	226	375
Gold, mine output, Au content	kilograms	6,037	5,703	5,995	8,904	11,504
Iron ore:						
Gross weight	thousand metric tons	3,203	5,678	7,561	6,736 [r]	6,389
Iron content	do.	1,900	3,400	4,537	4,042 [r]	3,833
Lime, hydrated and quicklime	do.	50	45	68	57 [r]	58
Molybdenum, mine output, Mo content		2,198	1,960	1,904	1,819	2,000
Petroleum, crude	thousand 42-gallon barrels	2,181	2,549	3,636	5,129 [r]	7,405
Salt, mine output		1,861	2,183	2,461	2,179 [r]	1,852
Silver, mine output, Ag content	kilograms	28,710	28,254	27,982	42,931	57,300 [e]
Steel, crude		64,200	60,000	68,100	56,000 [r]	64,400
Stone, crushed	thousand metric tons	101	94	233	230 [r]	240
Tungsten, mine output, W content		20	20	66	--	--
Zinc, mine output, Zn content		56,300	52,300	59,500	52,050	46,600

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. -- Zero.

[1] Table includes data available through August 13, 2015.

[2] In addition to the commodities listed, crude construction materials, such as gypsum, sand and gravel, and varieties of stones, such as limestone, were produced, but available information was inadequate to make reliable estimates of output.

TABLE 2
MONGOLIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity[e]
Calcium oxide	Qinhua MAK Naryn Sukhait LLC (Mongolia-China joint venture)	316 km from Ulaanbaatar at the Olon Ovoot station of the Trans Mongolia railway	50
Cement	Khutul Cement and Lime JSC	Darhan, Darhan-Uul Aimag	1,000
Coal	Baganuur Joint Stock Co. (Government, 51%, and public, 49%)	Baganuur Mine, Tov Aimag	3,000
Do.	Government, 95%, and public, 10%	Shivee Ovoo Mine, Dornogovi and Govisumber Aimags, 20 km from Choir City	2,000
Do.	SouthGobi Resources Ltd. (Turquoise Hill Resources Ltd., 58%, and China Investment Corp. 13.5%)	Ovoot Tolgoi Mine, Omnogovi (South Gobi) Aimag	4,600
Do.	do.	Tsagaan Tolgoi, Dornogovi Aimag, 95 km north of the China border	3,000
Do.	Mongolian Mining Corp., 100%	Ukhaa Khudag Mine, Omnogovi (South Gobi) Aimag, 61 km east of Dalanzadgad	8,600
Do.	MAK Mongolyn Alt Group, 100%	Naryn Sukhait Mines, Gurvantes Soum, Omnogovi Aimag	3,000
Do.	Terra Energy LLC (Guilford Coal Ltd., 100%)	Baruun Noyon Uul (BNU) coking coal mine, Omnogovi (South Gobi) Aimag, 80 km east of Naryn Sukhait Mines	1,000[2]
Do.	Mongolian Mining Corp., 100%	Baruun Naran Mine, Omnogovi (South Gobi) Aimag, 61 km east of Dalanzadgad	3,000
Copper, Cu in concentrates	Samsung Corp., 51%, and Erdenet Mining Corp. (Mongolia-Russia joint venture), 49%	Erdenet Ovoo open pit mine and processing plant, Orkhon Aimag, 180 km west of Darkhan City	140
Do.	Turquoise Hill Resources Ltd., 66%, and Government, 34%	Oyu Tolgoi Mine, Omnogovi (South Gobi) Aimag, 80 km north of the China border	150
Do.	MAK Mongolyn Alt Corp., 100%	Tsagaan Suvarga Mine, Omnogovi (South Gobi) Aimag, 560 km southeast of Ulaanbaatar	70
Copper, Cu in cathodes	Erdenet Mining Corp. (Mongolia-Russia joint venture), 51%, and Strand Holdings Ltd., 49%	Erdmin solvent extraction-electrowinning plant, 180 km west of Darkhan City	3
Fluorspar, ore	Mongolrostsvetmet LLC	Bor-Undur Mine and processing plant, Hentiy Aimag, 310 km southeast of Ulaanbaatar; 2 underground and 3 open pit mines	450[3]
Do.	do.	Urgen Mine, Dornogovi Aimag, 535 km from Ulaanbaatar	100[3]
Gold, ore	Zinjin Mining Group Co. Ltd., 70%	Nari Tolgoi Mine, Jierigron Sumu, Tov Aimag	90[3]
Do.	North Asia Resources Holdings Ltd.	Khar Yamaat placer mine, 180 km north of Ulaanbaatar	NA
Do.	Mogolian Resource Corp. Ltd., 90%	Blue Eyes Mine, Bornuur Soum, Tov Aimag	36[3]
Do. thousand cubic meters	Mongolrostsvetmet LLC	Zaamar placer gold operation, Tov Aimag, 240 km southwest of Ulaanbaatar	300[3]
Do. do.	do.	Zeregtsee placer mine, 240 km southwest of Ulaanbaatar	500[3]
Gold, Au in concentrates kilograms	Turquoise Hll Resources Ltd., 66%, and Government, 34%	Oyu Tolgoi Mine, Omnogovi (South Gobi) Aimag, 80 km north of the China border	19,000
Iron, Fe in concentrates	Lung Ming Mining Co. Ltd., 66.7%, and China Investment Corp., 33.3%	Eruu Gol Mine	2,500
Lead, ore	Shandong Xianglong Co. Ltd.	Tsav Mine, Dornod Aimag Ulaanbaatar	117[3]
Limestone	MAK Mongolyn Alt Group, 100%	14 km from the Olon Ovoot station of the Trans Mongolia railway	NA

See footnotes at end of table.

TABLE 2—Continued
MONGOLIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity[e]
Molybdenum	metric tons	Erdenet Mining Corp. (Mongolia-Russia joint venture)	Erdenet Ovoo open pit mine and processing plant, Bulgan Aimag, 180 km east of Darkhan City	3,000
Do.		Turquoise Hill Resources Ltd., 66%, and Government, 34%	Omnogovi (South Gobi) Aimag, 80 km north of the China border	NA
Petroleum, crude		PetroChina Daching Tamsag-Mongolia LLC (PetroChina)	Tamsag basin	NA
Do.		Sinopec	Southeast Gobi basin	NA
Silver	kilograms	Turquoise Hll Resources Ltd., 66%, and Government, 34%	Omnogovi (South Gobi) Aimag, 80 km north of the China border	30,000
Steel		Darkham metallurgy plant	Darhan, Darhan-Uul Aimag	100
Tungsten	metric tons	Samsung Corp., 51%, and Erdenet Mining Corp. (Mongolia-Russia joint venture), 49%	Erdenet Ovoo open pit mine and processing plant, Bulgan Aimag, 180 km west of Darkhan City	140
Zinc		Tsairt Minerals Co. Ltd. (China-Mongolia joint venture)	Sukhe Bator, Suhbaatar Aimag	70
Do.		China Nonferrous Metals Group, 51%, and Government, 49%	Tumurtiin Ovoo Mine, Sukhe Bator, 180 km southwest of Choibalsan	34
Zinc, ore		Shandong Xianglong Co. Ltd.	Tsav Mine, Dornod Aimag Ulaanbaatar	117 [3]

[e] Estimated. Do., do. Ditto. NA Not available.

[1] Abbreviations used for units of measure in this table include the following: km—kilometer.

[2] Resumed operations in December 2014.

[3] Mill capacity.

THE MINERAL INDUSTRY OF NEW CALEDONIA

By Sean Xun

New Caledonia, a special collectivity of France, is an island in the southwestern Pacific Ocean, east of Australia. The mining industry of New Caledonia was dominated by the production of chromium, cobalt, and, especially, nickel. About one-third of the land surface of New Caledonia's main island, Grande Terre, consists of massifs containing peridotite. The country's nickel resources account for about 25% of the world's total. As of 2014, about two-thirds of the mineralized zones were conceded to mine operators and one-half of them had been subject to indepth research. More than 1,700 mining titles were owned by approximately 50 holders. The nickel reserves in New Caledonia accounted for 15% of the world's nickel reserves, and the mine output accounted for 7% of the world's nickel production (SMSP Group, 2014, p. 10; Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015d; Kuck, 2015).

Minerals in the National Economy

In 2014, New Caledonia's real gross domestic product (GDP) increased to $11.1 billion, or by 2.8% t compared with that of 2013. The service, industry, and agriculture sectors contributed 71.8%, 26.8%, and 1.4%, respectively, to the total GDP. The country's economy remained heavily dependent upon nickel and byproduct cobalt production. In 2014, the total value of exports of nickel (including nickel, ferroalloys, nickel ore and concentrate, nickel matte, nickel oxide sinters, and other intermediate products) was $1.4 billion, which was about 10% of the GDP. As of the end of 2014, total employment in nickel mining and smelting was 6,308, of which 2,541 people were employed in mining, 1,595 were employed as mining contractors, and 2,172 were employed in nickel smelting (Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015a, g; United Nations, 2015; U.S. Central Intelligence Agency, 2015).

Government Policies and Programs

The Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie [Department of Industry, Mines and Energy of New Caledonia] (DIMENC) was the Government agency responsible for the sustainable industrial development of New Caledonia, as well as development and enforcement of a regulatory framework for industrial activities likely to harm the environment. Order No. 2006–4613/GNC of November 16, 2006, defined a broad mission for the DIMENC, including participating in the direction and implementation of energy policy and securing supplies of energy at competitive prices while managing energy consumption; promoting, organizing, and coordinating the valuation of mineral resources while ensuring the smooth integration of mining activities in social, economic, and physical environments; regulating industrial activities that might affect the environment or the health and safety of people; and ensuring a better understanding of the terrestrial and marine geologic structures of New Caledonia (Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015e, f).

The governing law for the mining sector is law No. 2009–6 (The Mining Code of New Caledonia), which was adopted by the Congress on April 16, 2009. The mining code took effect on April 30, 2009, together with Order No. 2009–2205/GNC of April 28, 2009, which established the regulatory component of the Mining Code. The Mining Code was supplemented by Resolution No. 20 of November 9, 2009, on the sale of nickel ores, chrome, and cobalt, which provides detailed regulations on the issuance of authorizations for ore transfer between local miners and international metallurgical operators (Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015c, d).

A public administrative Nickel Fund was established by Decision No. 467 of March 18, 2009. The purpose of the fund is to ensure the development and consolidation of the mining and metallurgical industry in New Caledonia in the event of a crisis in the sector as well as to ensure the proper rehabilitation of areas degraded by previous mining activity for the benefit of future generations. The fund supports municipalities and the mining and metallurgical sector by promoting the continuation or conversion of jobs in a crisis or when a mining operation is closed; financing of multiyear programs and rehabilitation of areas affected by mining activity; providing public subsidies for the repair of damage caused by previous mining activities on public lands; subsidizing, within the limits of available funding, organizations pursuing an objective of general interest; and participating in the financing of shares or investments made for the benefit of future generations of New Caledonia. Initial funding was about $19 million (Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015b).

Production

In 2014, New Caledonia produced about 13.1 million metric tons (Mt) of crude nickel ores, including about 8.8 Mt of saprolite ore and about 4.3 Mt of laterite ore. Total nickel content was 178,080 metric tons (t), including 141,223 t from saprolites and 36,856 t from laterites. The gross weight and nickel content of the nickel ores increased by 9.3% and 8.3%, respectively, compared with those of 2013. The increase was attributed to the increase in production at the Koniambo site and to strong demand from Japan, as well as mild weather throughout the year (table 1; Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015a).

In 2014, New Caledonia produced 54,683 t of ferronickel (nickel content), representing a 35% increase from that of 2013. The production increase was owing to an increase in production at metallurgical plants (table 1; Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015a).

Nickel matte (nickel content) production decreased by 38% to 8,241 t. Cobalt content in the crude ore was estimated to be about 8,000 t, and about 4,400 t was recovered. Cement production decreased by 10% in 2014 compared with that of 2013 (table 1; Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015a, g).

Structure of the Mineral Industry

Major companies actively involved in nickel mining operations in New Caledonia included Société Le Nickel (SLN), Nickel Mining Company SAS (NMC), Vale New Caledonia SAS (VNC), Georges Montagnat Mining Co., and Koniambo Nickel SAS (KNS). Three companies operated the following nickel smelting facilities in New Caledonia: the Doniambo pyrometallurgical plant (SLN), the Koniambo pyrometallurgical plant (KNS), and the Goro hydrometallurgical plant (VNC). The ownership, location, and production capacity of these facilities and others are provided in table 2 (SMSP Group, 2014, p. 10; Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015a).

Mineral Trade

In 2014, the total value of commodity exports from New Caledonia increased to $1.6 billion, or by 31% compared with that of 2013; commodity imports increased to $3.3 billion, or by 2.4%. The country's major commodity export partners were Japan, France, and China, which received 15.2%, 14.7%, and 14.0%, respectively, of New Caledonia's total exports. The country's major commodity import partners were France, Singapore, and Australia, providing 22.6%, 18.5%, and 9.6%, respectively, of New Caledonia's total imports (United Nations Comtrade and Service Trade, 2015).

The leading export commodities in 2014 were ferroalloys valued at $853.2 million; nickel ores and concentrates, $264.8 million; and nickel mattes, nickel oxide sinters, and other intermediate products, $246.1 million. In 2013, the exports of these three commodities were valued at $546.0 million, $195.3 million, and $259.1 million, respectively. The combined value of these three categories accounted for 84% of the total value of exported commodities (United Nations 2015).

In 2014, 5,414,687 t of nickel ore was exported compared with 4,458,974 t in 2013, including 2,017,985 t of laterites (1.5% nickel content) and 3,396,702 t of saprolites (1.95% nickel content). The nickel metal content of the exported ore amounted to 70,328 t, representing 39.5% of the tonnage of metal produced in 2014. The leading export partner for nickel ore, in terms of tonnage, was Australia, which received 2,017,985 t of ore containing 20,209 t of nickel metal and 100% of New Caledonia's lateritic ore export. Exports to Japan amounted to 1,766,139 t in 2014, representing a 70% increase in tonnage and a 65% increase in metal content compared with those of 2013. Shipments to the Republic of Korea decreased in gross weight to 1,630,563 t by 11.3%, and in metal content to 24,497 t by 12.9% (Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015a, g).

In 2014, exports of metallurgical products amounted to 300,579 t with 76,500 t of nickel content, representing a 31% increase in volume and a 17% increase in metal content compared with those of 2013. The increases were owing to production increases at the three metallurgical plants. Exports of ferronickel amounted to 214,956 t with 51,794 t of nickel content; nickel mattes, 12,919 t with 8,812 t of nickel content; nickel hydroxide, 66,019 t with 10,660 t of nickel content; and nickel oxide, 6,685 t with 5,234 t of nickel content. Exports of carbonate amounted to 628 t with 245 t of cobalt content (Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015a, g).

New Caledonia's export commodities were priced in dollars. The increase in the value of the U.S. dollar against the euro helped to mitigate the decrease in the price of nickel on the London Metal Exchange in the second half of 2014 (Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015a).

Commodity Review

Metals

Nickel and Cobalt.—Eramet Group of France, which was the leading ferronickel producer in the world, operated nickel mines and a metallurgical plant in New Caledonia through its subsidiary SLN. In 2012, SLN initiated a competitiveness plan to restore its profitability, primarily by focusing on reducing production costs. The goal was to reduce the cost of producing nickel by $1.50 per pound by 2018. In 2014, SLN was ahead of its operating plan for the year and had achieved a cost reduction of $0.62 per pound compared with the year target of $0.45 per pound. A major cost reduction plan included the decision in 2014 to build a new plant to increase the use of fuel oil instead of coal, particularly for pre-driers. The facility, which would be designed and built by Eramet Group and SLN, was located in Doniambo. The plant was expected to improve SLN's competitiveness when it begins operations in 2015. In 2014, SLN's Doniambo plant produced 55,012 t of metallurgical products compared with 53,015 t in 2013. As of the end of 2014, SLN had 845 employees at its mining sites and 1,259 employees at its Doniambo plant (Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015a; Eramet Group, 2015a, p. 9, 11; 2015b).

Société Minière du Sud Pacifique SA (SMSP) operated mining and predominantly metallurgical production facilities in New Caledonia through its subsidiaries KNS and NMC; SMSP held a 51% controlling interest in both. SMSP owned 17% of New Caledonia's conceded mining areas; the North plant's Koniambo deposit accounted for 4% of the area and NMC mining centers accounted for 13%. In 2013 (the latest year for which data were available), NMC produced 2,190,000 t of ore (all grades) compared with 1,784,000 t in 2012. Production of saprolite ore, mainly for shipment to the Gwangyang ferronickel plant in the Republic of Korea, totaled 1,838,703 t, and production of limonite ore, mainly for shipment to Australia, totaled 215,197 t (SMSP Group, 2014, p. 10, 12).

KNS was a joint venture between Glencore plc of Switzerland (49%) and SMSP (51%). The company was responsible for the management of mining operations and the construction and operation of the Koniambo ferronickel plant, which cost $7 billion and had a designed production capacity of 60,000 t/yr of nickel metal. In April 2013, the plant started the first production line of a pyrometallurgical ferronickel process. In February 2014, the first nickel tapping of the second production line was processed. The official inauguration of KNS's North plant was conducted in November 2014, and a metal leak occurred in the oven on December 26, 2014. No personnel injuries or environmental damage was reported. The accident led to the suspension of operations until the end of 2014. The plant was expected to produce between 27,000 t and 40,000 t of nickel in 2015 and to perform at full capacity by mid-2016. The plant site is located near a deepwater coastal area, which is suitable for development as a port facility. As of the end of 2014, KNS had 323 employees at its mining sites and 616 employees at its Koniambo plant (Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015a; SMSP Group, 2015a, b, d).

Ore to be used in the production of ferronickel at the North plant was extracted from the Koniambo massif, which is 20 kilometers (km) long and 5 km wide and includes an area of high-grade nickel laterite mineralization measuring approximately 21 square kilometers. There were estimated to be 75.6 Mt of measured and indicated saprolite resources at a grade of 2.47% nickel and 83 Mt of inferred resources at a grade of 2.5% nickel. The project site was served by a network of roads and was capable of supplying enough freshwater to meet mining and metallurgical requirements (SMSP Group, 2015c).

Vale S.A. of Brazil, through its subsidiary VNC, conducted nickel mining and metallurgical processing in New Caledonia. The company operated the Goro nickel and byproduct cobalt project. In 2014, VNC produced 2,134,000 t of ore at a grade of 1.44% nickel compared with 1,860,000 t of ore at a grade of 1.36% nickel in 2013. The output, in terms of metal content, was 18,700 t compared with 16,300 t in 2013. In 2014, VNC produced 1,384 t of cobalt as a byproduct of nickel production compared with 1,117 t in 2013. Within the next 2 years, the company was expected to continue to ramp up production to reach a nominal capacity of 57,000 metric tons per year (t/yr) of nickel oxide and hydroxide cake and 4,500 t/yr of cobalt in carbonate form. As of the end of 2014, VNC had 412 employees at its mining sites and 297 employees at its Goro plant (Direction de l'Industrie, des Mines et de l'Energie de la Nouvelle-Calédonie, 2015a; Vale S.A., 2015, p. 36, 39, 40, 45, 46).

As of the end of 2014, the proven reserves of nickel ore at VNC mines were estimated to be 55.3 Mt at a grade of 1.34% nickel and the probable reserves were estimated to be 67.0 Mt at a grade of 1.49% nickel. The total reserves in 2014 were 122.3 Mt at a grade of 1.42% nickel compared with 124.2 Mt at a grade of 1.42% nickel in 2013. The decrease in mineral reserves held by VNC was owing to mining depletion at the Goro Mine. Operations at the Goro open pit mine started in 2011, and the mine was projected to be exhausted in 2044. The nickel mineral reserves at the VNC mines had a grade of about 0.11% cobalt (Vale S.A., 2015, p. 67, 69).

In 2014, a protected wetland area was created by the local authorities of New Caledonia, which included 27% of the total surface area of the VNC tenements, and potentially could affect mining activities. The company expected that additional capital costs would be needed to address the potential affects on the tailings storage facility. In February 2014, a new law enacted by the South Province of New Caledonia imposed stricter limits on emissions of nitrogen oxide, sulfur oxide, and particulates from large combustion power stations. A power station that supplied electricity to VNC would likely need to be upgraded to meet the new standards, which was expected to increase the cost of power for VNC (Vale S.A., 2015, p. 76, 78).

In September 2014, JinPei Century Investment (Group) Co Ltd. (JinPei) of China signed an agreement with Mai Kouaoua Mines (MKM) to mine and process nickel ore in New Caledonia. Under the agreement, JinPei would invest $1.25 billion and take a 49% stake in MKM, which owned several mines in New Caledonia. JinPei was expected to produce 10,000 t/yr of nickel starting in 2018, and the output would later be increased to 30,000 t/yr. The mine output would be shipped to Vanuatu for smelting. MKM would hold 51% equity in the Vanuatu plant, and JinPei, 49% (Asia Miner, 2014).

Outlook

New Caledonia is expected to remain a globally significant cobalt- and nickel-producing country. In the short run, production is expected to increase at the Goro and Koniambo projects. In the long run, continued investment in new projects and expansion of current projects, along with the improved market conditions, could facilitate the expansion of the mineral industry in New Caledonia.

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TABLE 1
NEW CALEDONIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
Cement		161,236	147,761	123,668	118,531 [r]	106,469
Nickel:						
Ore:						
Gross weight	thousand metric tons	8,709	8,835	9,659	12,004 [r]	13,115
Co content		2,850	3,240	3,500	3,190	4,400 [e]
Ni content		131,309	128,732	131,693	164,406 [r]	178,080
Ferronickel:						
Gross weight		165,506	169,513	184,476	171,000 [e]	231,000 [e]
Ni content		39,802	40,015	43,030	40,459	54,683
Matte:						
Gross weight[e]		18,600	18,400	17,900	17,700	11,000
Ni content		13,917	13,780	13,417	13,279	8,241

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised.

[1] Table includes data available through August 27, 2015.

[2] In addition to the commodities listed, chromite, copper, crushed stone, gold, iron, manganese, silica, and silica sand were produced, but available information was inadequate to make reliable estimates of output.

TABLE 2
NEW CALEDONIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Cement	Tokuyama Nouvelle Calédonie S.A. (Tokuyama Corp., 74.1%)	Grinding plant, Noumea	200,000
Cobalt, in ore and concentrate, Co content	Société le Nickel (SLN) [Eramet Group, 56%; Société Territoriale Calédonienne de Participation Industrielle (STCPI), 34%; Nisshin Steel Co., 10%]	Kouaoua, Nepoui-Kopeto, Poum, Thio, and Tiebaghi mining centers	3,000
Do.	Vale S.A., 80.5%; Sumic, 14.5%; Société de Participation Minière du Sud Calédonien SAS, 5%	Goro, 58 kilometers east of Noumea in South Province	4,500
Nickel:			
In ore and concentrate, Ni content	Société le Nickel (SLN) [Eramet Group, 56%; Société Territoriale Calédonienne de Participation Industrielle (STCPI), 34%; Nisshin Steel Co., 10%]	Kouaoua, Nepoui-Kopeto, Poum Thio, and Tiebaghi mining centers	55,000
Do.	Nickel Mining Company SAS [Société Minière du Sud Pacifique (SMSP), 51%, and POSCO, 49%]	Ouaco, Poya, Nakety, Kouaoua, and Boakaine mining centers	31,000
Do.	Société des Mines de la Tontouta, 100%	Moneo and Nakety mining centers	50,000
Do.	Other small nickel mining companies, including Société Minière George Montagnat SA (SMGM)	Tontouta mining center	1,000
Do.	Vale New Caledonia SAS (VNC) (Vale S.A., 80.5%; Sumic, 14.5%; Société de Participation Minière du Sud Calédonien SAS, 5 %)	Goro, 58 kilometers east of Noumea in South Province	60,000
In ferronickel, Ni content	Koniambo Nickel SAS (KNS) (Société Minière du Sud Pacifique SA, 51%, and Glencore plc, 49%)	Koniambo plant in North Province	60,000
Do.	Société le Nickel (SLN) [Eramet Group, 56%; Société Territoriale Calédonienne de Participation Industrielle (STCPI), 34%; Nisshin Steel Co., 10%]	Doniambo, Noumea	60,000
In nickel matte, Ni content	do.	do.	15,000
In nickel oxide, Ni content	Vale New Caledonia SAS (Vale S.A., 80.5%; Sumic, 14.5%; Société de Participation Minière du Sud Calédonien SAS, 5 %)	Goro plant in South Province	57,000

[e] Estimated. Do., do. Ditto.

THE MINERAL INDUSTRY OF NEW ZEALAND

By Lin Shi

New Zealand is a country located in the southwestern Pacific Ocean. It consists of two main islands that were formed by volcanoes and shaped by glaciation. Industries on the North Island included cement manufacture, coal mining, and petroleum and natural gas production. Industries on the South Island included aluminum smelting, gold mining, and coal production. In 2014, New Zealand's gross domestic product (GDP) was valued at about $200 billion at current market prices. The annual rate of growth of the GDP in 2014 was 3.0% compared with 2.5% in 2013. Economic growth was the result of higher prices of some export commodities and increased investment in the construction sector (Reserve Bank of New Zealand, 2014, 2015; New Zealand Now, 2016; World Bank, The, 2016).

Minerals in the National Economy

New Zealand's mineral industry played an important role in the country's economy. In 2014, the sector contributed about $1 billion to the nation's GDP and about $20 million in royalties to the Government. Activities included the mining of coal, gold, industrial minerals, iron sand, and silver. About 1,000 mineral exploration and mining permits were issued by yearend 2014. Small- and medium-sized mining operators held approximately 980 mineral exploration and mining permits to conduct extracting, quarrying, and processing activities across the country. About 20 large mining operations extracted aggregates, coal, and gold. Significant metallic minerals included gold, iron sand, and silver. Significant nonmetallic minerals included clays, diatomite, perlite, pumice, serpentine, silica sand, and zeolites (New Zealand Petroleum and Minerals, 2016a).

Government Policies and Programs

In New Zealand, multiple Government agencies, together with regional and district councils, share the responsibility for regulating mineral industry activities. On November 10, New Zealand Petroleum and Minerals, an agency under the Ministry of Business, Innovation and Employment, approved the proposal to reduce fees for getting offshore petroleum prospecting permits and offshore minerals permits. It sought to ensure that Government fees reflect the administrative costs for these types of permits and to remove barriers to industry investment. The changes included an annual flat rate of $50,000 for all nonexclusive (multiclient) Petroleum Prospecting Permits (PPPs), annual rates of $1 per square kilometer for exclusive PPPs and $10.73 per square kilometer for offshore mineral exploration permits, and annual rates of $102.22 per square kilometer for offshore mineral mining permits. These new regulations were expected to be effective in early 2015. The Government allocated petroleum exploration permits in an annual tender called a "block offer," which enabled the efficient allocation of exploration areas to all investors. The Government selected the release areas for block offers in 2012, opened the selections for bidding, and then awarded permits to operators. On November 14, the Ministry of Energy and Resources, which is a component of the Department of the Prime Minister and Cabinet, announced open consultation on the proposed petroleum block offers for 2015. The proposal includes three onshore and four offshore crude oil and natural gas areas, which cover about 476,000 square kilometers (km^2), compared with about 434,000 km^2 in block offers for 2014, which the Government opened in 2013. From 2012 to 2014, the Government launched three minerals tenders—Northland 2012, Epithermal Gold 2013, and Platinum 2013, to encourage global investment and to promote the country's mineral exploration activities (New Zealand Petroleum and Minerals, 2014a, b; 2016b, c, e).

Production

In 2014, the production of dolomite more than tripled compared with that in 2013; total clays (including kaolin and clay designated for use in brick and tile) increased by about 150%; limestone for agricultural use increased by 56%; sand and gravel for building aggregate increased by about 45%; silver production increased by about 40%; and gross production of crude petroleum and natural gas each increased by 12%. Production of pumice and dimension stone each decreased by 27%; coal, by about 13%; and gold, by about 4% (table 1).

Structure of the Mineral Industry

Table 2 lists major mineral industry facilities in New Zealand, which has mineral occurrences of bentonite, clays, coal, diatomite, gold, iron sand, perlite, pumice, serpentine, silica sand, silver, and zeolites. A wide range of minerals and materials were produced and contributed to other economic sectors, such as agriculture, construction, energy, manufacturing, and transportation (New Zealand Petroleum and Minerals, 2016e).

Mineral Trade

In 2014, the total value of exports (goods and services) increased by 12% to $54 billion (NZD68.0 billion) from $49 billion (NZD61.9 billion) in 2013.[1] China, which was the leading destination for exports, received 23% of New Zealand's total exports in 2014, followed by Australia, which accounted for 17%. The total value of the country's imports increased by 8% in 2014 to $50 billion (NZD63.0 billion) from $48 billion (NZD59 billion) in 2013. The countries of the European Union (EU) were the leading source of imports in

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[1] Where necessary, values have been converted from New Zealand dollars (NZD) to U.S. dollars (US$) at an average rate of NZD1.255=US$1.00 for 2014, and NZD1.270=US$1.00 for 2013. All values are nominal, at current prices, unless otherwise stated.

2014, providing 18% of New Zealand's imports, followed by China, which accounted for 17% (Statistics New Zealand, 2016).

In 2014, New Zealand exported about $4 billion worth of goods to the United States, of which iron and steel products were valued at about $69 million; bauxite and aluminum, about $24 million; copper, about $3 million; and coal and related fuels, about $0.5 million. The United States exported about $4 billion of goods to New Zealand, of which petroleum products were valued at about $56 million; iron and steel products, about $9 million; alumina and aluminum, about $6 million; precious metals, about $4 million; and nonferrous metals, about $0.8 million (U.S. Census Bureau, 2015a, b; U.S. Central Intelligence Agency, 2015; Statistics New Zealand, 2016).

Commodity Review

Metals

Aluminum.—Bauxite deposits were discovered in the Northland region of the North Island of New Zealand; however, bauxite had not been mined. Aluminum was smelted at Tiwai Point in the Southland region of the country's South Island, and alumina was imported from Queensland, Australia. New Zealand Aluminum Smelters Ltd. (NZAS) was a primary aluminum producer and New Zealand's only aluminum smelter. NZAS was a joint venture of Pacific Aluminum Ltd. of New Zealand (79.36%) and Sumitomo Chemical Co. Ltd. of Japan (20.64%). Pacific Aluminum Ltd. of New Zealand (a wholly owned subsidiary of Rio Tinto Ltd.'s Meridian Energy) supplied electricity to the Tiwai smelter at reduced prices in 2014. The demand for and the price of aluminum had decreased during the past several years. In 2014, NZAS reported production of 328,269 metric tons (t) of aluminum, which was a 1.1% increase compared with production in 2013. NZAS' aluminum production in 2014 included 118,763 t of high-purity aluminum ingot, 85,405 t of billet, 46,931 t of rolling block, 36,022 t of standard purity ingot, 13,339 t of foundry ingot, and 27,811 t of other value-added aluminum ingot. NZAS employed 800 people in 2014, and 58% of its aluminum production was exported to Japan (New Zealand Aluminum Smelters Ltd., 2015, p. 20).

Gold.—In 2014, New Zealand's gold production was about 12 t. The country's gold production was mainly from the Waihi area on the North Island and from the Otago region on the South Island. Newmont Mining Corp. of the United States and OceanaGold Corp. (OGC) of Australia were the two major operators of New Zealand's hard-rock mines. The country also had several medium-sized alluvial operations and a large number of small alluvial mines. Newmont Waihi Gold, which was a subsidiary of Newmont Mining, mined the Martha and the Trio Mines in and around Waihi on the North Island. The company reported that it produced 4.1 t (reported as 132,000 troy ounces) of gold in 2014. Oceana Gold Ltd. (a subsidiary of OGC) was the operator for the Macraes operation and the Reefton operations on the South Island. The Macraes operation consisted of the Macraes open pit mine, the Frasers underground mine, and the Macraes processing plant. In 2014, OGC reported that it produced 6.26 t (reported as 201,207 troy ounces) of gold and sold 6.48 t (reported as 208,462 troy ounces) of gold valued at $862 per troy ounce (Newmont Mining Corp., 2015, p. 32; OceanaGold Corp. 2015a, p. 11; 2015b, p. 7; Waihi Gold Co. Ltd., 2015, p. 1–7).

Silver City NZ Pty Ltd. of Australia acquired a 5-year permit in 2013 from the New Zealand Government to explore for gold in an area of 33 km^2 on the North Island's central volcanic plateau, south of Kawerau. The Government opened a tender for mineral exploration in the central volcanic zone, which is located across from the Bay of Plenty and Waikato regions of the North Island, where gold and silver had been identified (Ministry of Business, Innovation and Employment, 2015).

Iron Ore and Iron and Steel.—The main type of iron ore deposit found in New Zealand was titano-magnetite iron sand, but other types of iron materials were found at minor deposits in the country. Various attempts had been made to smelt iron sand in New Zealand, but the high titanium content and fine grain size made the ore unsuitable for processing using traditional blast furnace technology. New Zealand Steel Ltd.'s fully integrated steel mill produced about 650,000 metric tons per year of steel in a range of flat steel products for both domestic and export markets. The company used iron sand and coal to make iron and steel. The iron sand came from the Waikato North Head Mine and concentration plant, which is located 18 kilometers south of the company's Glenbrook mill. New Zealand Steel, which was a subsidiary of BlueScope Steel Ltd. of Australia, exported about 60% of its steel production. In 2014, New Zealand mined about 2.1 million metric tons (Mt) of iron ore and produced about 700,000 t of pig iron and about 900,000 t of crude steel. The country exported about 2.2 Mt of iron ore and about 367,000 t of iron scrap, and imported about 15,000 t of iron scrap (World Steel Association, 2015, p. 102–103, 107, 109; New Zealand Steel, 2016).

Industrial Minerals

Cement.—In 2014, New Zealand produced about 1.2 Mt of cement, which was about the same level of production as in 2013. The country's domestic cement consumption was about 1.15 Mt in 2014, which was about a 5% increase compared with the 1.10 Mt consumed in 2013. In 2014, New Zealand exported about 0.11 Mt of cement (a decrease of about 15% compared with that of 2013) and imported about 0.17 Mt of cement (an increase of about 31% compared with that of 2013). The residential markets of Auckland and Canterbury were the main components of new construction and demand for cement, and demand in Waikato and Wellington was helped by nonresidential projects. Golden Bay Cement (a subsidiary of New Zealand's Fletcher Building Group) and Holcim New Zealand Ltd. (a subsidiary of Switzerland's Holcim Ltd.) were the country's two major cement companies; they had a combined annual capacity of 1.4 Mt from their integrated plants and grinding station. In 2014, Holcim installed a 0.5-million-metric-ton-per-year-capacity wet-cement process line at its Westport plant and constructed a 30,000-t cement terminal at Timaru. In 2014, Golden Bay Cement replaced one-third of the Whangarei cement plant's fuel source (coal) with wood to reduce its annual carbon dioxide emissions by 58%. The country's current carbon tax had caused cement producers to shift away from clinker production to cement grinding. Golden Bay Cement, Holcim, and HR Cement produced ordinary portland cement in 2014, which was the most used cement worldwide. Golden Bay Cement and Holcim, also produced premium portland cement by using fly ash and other cementitious materials to increase the strength of the concrete (Golden Bay Cement, 2015a–c; Holcim New Zealand Ltd., 2015a–c; International Cement Review, 2015, p. 248–249).

Mineral Fuels

Coal.—In 2014, New Zealand produced about 4 Mt of coal, which was a decrease of about 13% compared with 4.6 Mt in 2013. Bituminous coal accounted for about 1.9 Mt; subbituminous coal, about 1.7 Mt; and lignite coal, about 0.3 Mt. Coal prices decreased by at least 30% during the past 2 years in the international market. In July, Bathurst Resources Ltd. began its initial work at the Escarpment coal mine on the Denniston plateau near Westport; the company expected the price of coking coal to rebound. The company's activities included clearing the site for coal storage, constructing infrastructure, and installing water management systems (Bathurst Resources Ltd., 2014). Coal accounted for about 4% of New Zealand's total energy consumption annually. Bituminous coal resources were located mainly in the West Coast region of the South Island, and subbituminous coal resources were found mainly in the Waikato region of the North Island. Lignite resources were mainly found in the Otago and the Southland regions of the South Island. New Zealand exported coal to China, India, and Japan. State-owned Solid Energy New Zealand Ltd. was the leading coal producer in the country and operated mines at Waikato in the central region of the North Island, along the west coast of the North Island, and in the Southland regions of the South Island. Solid Energy had recently signed a new 5-year supply arrangement with New Zealand Steel that would be effective from 2014 to 2019, and a 4-year arrangement with Genesis Energy that would be effective from 2014 to 2018 (Ministry of Economic Development, 2010; Ministry of Business, Innovation and Employment, 2015; New Zealand Petroleum and Minerals, 2016d; Solid Energy New Zealand Ltd., 2016).

Natural Gas and Petroleum.—In 2014, New Zealand's production of natural gas increased by about 12%, whereas the consumption of natural gas increased by about 9% compared with that of 2013. The country's natural gas was produced in the Taranaki region of the North Island. Methanex Corp. of Canada, which was a methanol producer in New Zealand, was a major consumer of domestic natural gas. The Mai and the Mangahewa fields were the leading contributors to New Zealand's natural gas production increase in 2014. Mangahewa increased its natural gas production by 39% in 2014 compared with that of 2013, and was a major supplier to Methanex. New Zealand's crude oil production increased by 12% in 2014 compared with that of 2013. Some of the country's domestic crude oil production was sent to the Marsden Point refinery for processing. Exports of crude oil increased by 16% in 2014 compared with that of 2013. The country's crude oil was generally exported to Australia. Crude oil refinery production and imports decreased by 2% and 3.9%, respectively, in 2014 compared with that of 2013. About 52% of the country's crude oil imports were from the Middle East, compared with 59% in 2013 (Ministry of Business, Innovation and Employment, 2015).

Outlook

New Zealand's mineral sector is expected to continue to play an important role in the country's economic development. The Government is expected to encourage investment in mining and mineral exploration activities. The production of coal, gold, iron sand, and silver were expected to remain steady or gradually increase owing to market demand, stable mineral commodity prices, and increased production capacities. The exploration and production of other minerals, including base metals, platinum-group metals, phosphate, silica sand, and sulfur, may increase. Under the Crown Minerals Amendment Act 2013, the exploration restrictions for some minerals have been redefined on public areas. The Government is likely to further promote the export of domestic mineral products and commodities. New Zealand's natural gas production will continue to be dominated by the Pohokura and the Maui fields, which together account for more than 50% of domestic production. The country's crude oil production will likely continue to be dominated by the Pohokura and the Maari fields, which produce 29% and 21%, respectively, of domestic production. The country is expected to continue to explore new sources of renewable energy, including biogas, woody biomass, geothermal, hydropower, solar, and wind (Ministry of Business, Innovation and Employment, 2015; New Zealand Petroleum and Minerals, 2016f).

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TABLE 1
NEW ZEALAND: PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity		2010	2011	2012	2013	2014
METALS						
Aluminum metal, smelter, primary		343,335	354,029	326,963	324,835	328,269
Gold, mine output, Au content	kilograms	13,494	11,761	10,164	12,468	11,989
Iron and steel:						
Iron sand, titaniferous magnetite, gross weight	thousand metric tons	2,439	2,357	2,395	3,157	3,245
Iron sand, iron content[e]	do.	1,390	1,340	1,360	1,800	1,850
Pig iron[e]	do.	667	659	669	680	670
Steel, crude[e]	do.	853	844	912	900	900
Silver, mine output, Ag content	kilograms	17,136	14,324	5,629	11,223	15,811
INDUSTRIAL MINERALS						
Cement, hydraulic[e]	thousand metric tons	1,100	1,200	1,200	1,200	1,200
Clays:						
Bentonite		1,216	--	2,263	762	--
For brick and tile		30,192	10,911	71,487	62,288	125,508
Kaolin, pottery		10,700	21,545	11,578	13,066	61,382
Diatomaceous earth		95	--	--	4	43,624
Lime[e]		170,000	175,000	175,000	175,000	175,000
Nitrogen, N content of ammonia[e]		120,000	120,000	125,000	125,000	125,000
Perlite		5,088	--	3,598	--	--
Pumice		118,249	229,268	72,414	93,865	68,835
Salt[e]		95,000	95,000	95,000	100,000	100,000
Sand and gravel:						
Silica sand, glass sand		113,231	109,346	73,064	101,702	113,602
Other industrial sand		1,726,236	1,203,103	1,517,308	1,283,125	1,411,819
For roads and ballast	thousand metric tons	13,257	15,258	15,439	19,947	21,497
For building aggregate	do.	7,528	6,183	6,561	8,044	11,654
Stone:						
Dimension		18,911	140	8,614	17,769	13,061
Dolomite		86,399	59,782	86,040	5,542	22,925
Limestone and marl:						
For agriculture	thousand metric tons	1,686	1,387	1,020	1,419	2,219
For cement	do.	1,800	1,705	1,797	1,884	1,949
For other industrial uses	do.	1,054	185	364	388	466
Serpentine		43	41,201	36,731	52,353	--
Zeolites		--	3,523	--	155	--
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand metric tons	5,330	4,944	4,926	4,625	3,992
Natural gas:						
Gross production	million cubic meters	5,052	4,678	5,188	5,583	6,253
Marketed production		4,432	4,003	4,559	4,866	5,440
Petroleum:						
Crude	thousand 42-gallon barrels	19,302	16,591	14,149	12,325	13,804
Refinery products[e]	do.	34,000	33,000	39,000	37,000	38,000

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[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. do. Ditto. -- Zero.

[1] Table includes data available through December 31, 2015.

[2] In addition to the commodities listed, New Zealand produced a number of other mineral commodities, which included lead (refinery output, secondary), marble, and liquefied petroleum gas, but available information was inadequate to make reliable estimates of output.

TABLE 2
NEW ZEALAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities	Annual capacity[e]
Aluminum		New Zealand Aluminium Smelters Ltd. (NZAS) (Pacific Aluminium, 79.36%, and Sumitomo Chemical Co., 20.64%)	Tiwai Point smelter Southland, Invercargill	350
Cement		Golden Bay Cement (Fletcher Building Group.)	Whangarei plant	900
Do.		Holcim New Zealand Ltd. (Holcim Ltd.)	Cape Foulwind, Westport	500
Coal		Solid Energy New Zealand Ltd.	Stockton Mine, Buller, Westport	2,500 [1]
Do.		do.	Pike River Mine, Greymouth	1,000 [1]
Do.		do.	Spring Creek Mine, Greymouth	1,000 [1]
Do.		do.	Rotowaro Mine, Huntly	1,500
Do.		do.	Huntly East Mine, Huntly	500
Do.		do.	New Vale Mine, Invercargill	300
Do.		do.	Ohai Mine, Ohai	200
Do.		do.	Terrace Mine, Reefton	100
Gold	metric tons	Newmont Waihi Gold (Newmont Mining Corp.)	Martha, Trio, in Waihi	5
Do.	do.	Macraes gold project (OceanaGold Corp.)	Macraes, Reefton, in Otago	7
Iron and steel:				
Iron ore		New Zealand Steel Ltd. (BlueScope Steel Ltd.)	Taharoa, 150 kilometers south of Auckland	1,400
Do.		do.	Waikato North Head, 30 kilometers south of Auckland	1,400
Steel		do.	Glenbrook	650
Do.		Pacific Steel Group (Fletcher Building Ltd.)	Otahuhu Mill, Auckland	300
Kaolin		Imerys Tableware New Zealand Ltd.	80 kilometers northwest of Whangarei	25
Petroleum, refinery	barrels per day	New Zealand Refinery Co.	Marsden Point oil refinery Marsden Point	95,000
Salt		Dominion Salt Ltd.	South of Blenheim	70
Silver	metric tons	Newmont Waihi Gold (Newmont Mining Corp.)	Waihi	30
Do.	do.	OceanaGold Corp.	Otago	1

[e] Estimated. Do., do. Ditto.

[1] Partially under care and maintenance.

THE MINERAL INDUSTRY OF PAKISTAN

By Karine M. Renaud

Pakistan is rich in such mineral resources as clays (including china clay and fireclay), copper, dolomite, gypsum, iron ore, limestone, marble (onyx), salt, sand and gravel, and silica sand; coal, crude oil and natural gas; and precious and semiprecious stones. Pakistan ranked 3d in world production of iron oxide pigments, 10th in world production of barite, and 16th in world production of cement. The country is among the world's 18 leading producers of white cement (Kuo, 2014; Global Cement, 2014d; McRae, 2016; Tanner, 2016; van Oss, 2016).

Minerals in the National Economy

Pakistan's real gross domestic product (GDP) increased by 4.1% in 2014 compared with an increase of 3.7% (revised) in 2013 owing to an increase in the output of the construction sector and expansion of the manufacturing and services sectors. Pakistan's industrial sector accounted for 20.8% of the GDP in 2014 compared with 20.9% (revised) in 2013. Manufacturing accounted for 65.0% of the overall industrial sector output in 2014 compared with 63.0% in 2013; the sector accounted for 13.5% of the GDP, which was an increase of 5.6% in 2014 compared with an increase of 3.5% in 2013. The mining and quarrying sector accounted for 14.5% of the industrial sector in 2014 compared with 14.7% in 2013, and 3.0% of the GDP in 2014 compared with 3.1% in 2013. The rate of growth of the mining and quarrying sector was 4.4% in 2014 compared with 3.8% (revised) in 2013. In 2014, despite the 3.7% rate of growth for electricity generation and distribution and gas distribution sectors, Pakistan continued to face power shortages. The power shortages had a negative effect on the country's economy and constrained the rate of growth of the GDP. The Government approved the use of grid-connected solar energy, installation of rooftop solar panels, and mortgage financing for installation of home solar panels to ameliorate the energy crisis in Pakistan in 2014. After the World Bank offered to finance the feasibility study for and installation of a transmission line to send electricity to Pakistan from 1,200 megawatts (MW) of generating capacity in India, a memorandum of understanding between the Governments of India and Pakistan was approved by both countries in 2014. The importation of electricity by Pakistan from India was expected to start in January 2015 (Ministry of Finance, 2013b, p. 7–8, 11; Economic Times, The, 2014; Ministry of Finance, 2014c, p. ii; Saeed, 2014).

Foreign direct investment (FDI) increased to $1.75 billion in 2014 from $1.33 billion in 2013. Oil and gas exploration was of major interest to foreign investors (Asian Development Bank, 2015, p. 172; United Nations Conference on Trade and Development, 2015).

Government Policies and Programs

The National Mineral Policy (NMP) of 1995 was amended and implemented by the Ministry of Petroleum and Natural Resources in February 2014. Minerals, not including nuclear minerals, such as uranium, are located in special federating units, including federally administered tribal areas, the Islamabad Capital Territory, and the International Offshore Water Territory. The NMP states that Provincial governments and federating units are responsible for the regulation, detailed exploration, mineral development, and safety of these operations and for making decisions related to these activities. Federal responsibilities include geologic and geophysical surveying and mapping, national and international coordination, and formulation of national policies and plans. The Federal Government provides support and advice to the Provinces. Royalties on the mineral commodities produced are determined periodically by the respective government and paid to the Provincial governments, federating units, and the Federal Government (Ministry of Petroleum and Natural Resources, 2013, p. 8, 18).

In 2012, the Home Department within the government of Sindh Province had imposed a ban on illegal excavation of sand and gravel and precious stones within the Thatta District under section 144 of the Criminal Procedure Code (Cr.P.C.). Police were directed to take strict action against violators and were authorized to register complaints under section 188 of the Pakistan Penal Code for violations of section 144 of the Cr. P.C. As of 2014, no update on the ban was available (Onepakistan News, 2012; Pakistan Newswire, 2012).

In January 2013, the Mines and Minerals Department of Punjab Province awarded 110 fireclay exploration licenses. The licenses awarded used modern equipment to dig and identify new areas of fireclay resources. In 2014, the Ministry for Petroleum and Natural Resources, after achieving an agreement among all Provinces and finalizing the Model Petroleum Concession Agreement and the Model Exploration License for onshore natural gas and oil exploration, awarded 50 petroleum exploration blocks with a total area of 103,348 square kilometers (km^2) to eight companies; 38% of the blocks were under exploration by yearend. The petroleum concession agreements and the exploration licenses were signed by the Minister of Petroleum and Natural Resources in February 2014. Oil and Gas Development Co. Ltd. (OGDCL) was awarded 29 exploration blocks; Pakistan Petroleum Ltd. (PPL), 10; Pakistan Oilfields Ltd. (POL), 3; Al-Haj Enterprises and Oil and Gas Investment Ltd., 2; and Tallahassee Petroleum Inc. of Canada, Mari Petroleum Ltd., OMV (Pakistan) Exploration GmbH, and Ocean Pakistan Ltd., 1 each. Of the 50 exploration blocks, 21 were located in Balochistan Province, with a total area of 45,770 km^2; 15 were located in Punjab Province, with a total area of 32,272 km^2; 8 were located in Khyber Pakhtunkhwa Province, with a total area of 10,550 km^2; and 6 were located in Sindh Province, with a total area of 14,756 km^2 (Associated Press of Pakistan, 2013; Ministry of Petroleum and Natural Resources, 2014a, b).

In February 2014, the Government of Pakistan signed eight additional petroleum concession agreements and eight additional exploration licenses with Al-Haj Enterprises (Pvt.) Ltd. for Block No. 3169–4 in Baska North and Block No. 3271–6 in Potwar South; OGDCL for Orkzai Block No. 3369–1, Hetu Block No. 3170–7, and Zorgarh Block No. 2868–7; OMV (Pakistan) Exploration GmbH and PPL for Margand Block No. 2866–4 and Kuhan Block No. 2867–5; and PPL for Block No. 2569–5 in Khipro East (Ministry of Petroleum and Natural Resources, 2014b).

In 2014, Pakistan's Government awarded China Harbor Works of China a $130 million contract to construct the first Pakistan International Bulk Terminal (PIBT) at Port Qasim. The total cost for the construction of the PIBT, including equipment, was estimated to be $250 million. In the first phase, the terminal was expected to handle 12 million metric tons per year (Mt/yr) of imported coal, 5 Mt/yr of cement, and 2 Mt/yr of clinker. In the second phase, the terminal was expected to handle 20 Mt/yr of coal. The construction of the terminal was expected to start in 2014 and to be completed in 2016 (Global Cement, 2014c).

Production

Production of dolomite increased by 174%; feldspar, by 114%; fuller's earth, by 100%; bentonite, by 95%; antimony and sulfur, native, by 43% each; bauxite (gross weight), by 23%; gypsum, by 17%; petroleum, crude, by 16%; soda ash, by 15%; fluorspar, by 12%; fireclay and uranium (processed, U content), by 10% each; and cement, by 3%. Production of phosphate rock (P_2O_5 content) decreased by 66%; coal, coke, iron ore, and magnesite, by 44% each; chalk, by 38%; kaolin, by 35%; chromium ore (gross weight and Cr_2O_3 content), by 28% each; silica sand, by 26%; talc, by 25%; phosphate rock (gross weight), by 15%; ocher and pig iron, by 14% each; marble, by 13%; and crude steel, by 7%. Data on mineral production are in table 1.

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Mineral Trade

In 2014, Pakistan's total exports increased by 2.4% to $25.1 billion from $24.5 billion in 2013. Pakistan's exports of chemicals and chemical products increased by 5.91%; cement, by 2.50%; and petroleum products, by 4.69%. Pakistan exported cement to Afghanistan, Djibouti, India, Iraq, Kenya, Mozambique, South Africa, Sri Lanka, Sudan, and Tanzania. Pakistan's major export partners were, in order of value, the countries of the European Union (21.2%), the United States (15%), China (10%), the United Arab Emirates and Afghanistan (7% each), and the United Kingdom (6%). Exports of gemstones and jewelry increased to $1.3 billion in 2013 from that of 2012 (Ministry of Finance, 2013c; 2014d, p. 121; Ministry of Commerce, 2014; Pakistan Bureau of Statistics, 2014).

Pakistan's total imports increased by 0.3% to $45.1 billion in 2014 compared with $44.95 billion (revised) in 2013. The main import categories were, in order of value, manufactured iron and steel ($1.1 billion), iron and steel scrap ($589 million), fertilizer ($584 million), gold ($28 million), petroleum products ($7.5 million), and crude petroleum ($4.7 million) (Ministry of Commerce, 2014; Ministry of Finance, 2014d, p. 122; Pakistan Bureau of Statistics, 2014; Trade Development Authority of Pakistan, 2014, p. 23, 28, 31–33, 39).

Commodity Review

Metals

Copper and Gold.—In 2014, gold was produced at the Saindak copper and gold mine, which remained the only producing copper and gold mine in Pakistan. The Saindak copper and gold mine, which is located in the Chagai Hills in Balochistan Province, also produced copper. In 2014, despite a reduction in minable ore and increased hardness of ore, the Metallurgical Corp. of China Ltd. (MCC) reported production of 13,122 metric tons (t) of copper content. The agreement on mining licenses between MCC and the Government for the Saindak copper and gold mine was extended until October 2017 (Metallurgical Corporation of China Ltd., 2013, p. 18; 2014, p. 21; Bullion Street, 2014).

FDI in the Reko Diq copper and gold mining project was estimated to be $3.3 billion; the project was expected to receive the largest influx of FDI of any project in Pakistan. The Reko Diq deposit is located in northwestern Balochistan Province. Tethyan Copper Corp. (Pvt.) Ltd. (Tethyan), which was a joint venture of Antofagasta plc of the United Kingdom and Barrick Gold Corp. of Canada, owned 75% of the Reko Diq project, and the remaining 25% was owned by the government of Balochistan Province. Tethyan conducted a feasibility study in August 2010; the total mineral resource was estimated to be 5.81 million metric tons (Mt) at a grade of 0.41% copper and 0.22 gram per metric ton (g/t) gold. The economic reserve was estimated to be 2.17 Mt at an average grade of 0.53% copper and 0.30 g/t gold. Reko Diq's production capacity was expected to be 196,800 metric tons per year (t/yr) of copper and 8,040 kilograms per year of gold from 560,500 t/yr of concentrate. In February 2011, Tethyan submitted a mining lease application, which included an environmental and social impact assessment. The application was rejected by the government of Balochistan Province in November 2011 for unknown reasons. In 2013, Tethyan decided to seek monetary damages from the Government of Pakistan under the auspices of the International Center for the Settlement of Investment Disputes (ICSID) and the government of Balochistan Province under the auspices of the International Chamber of Commerce (ICC). The hearing for the ICC was scheduled for June 23, 2014, and the hearing for the ICSID was scheduled for October 6, 2014. In 2014, the ICSID encouraged the Government of Pakistan and Tethyan to try to negotiate an out-of-court settlement. If the two sides could reach a mutual agreement, the award request would be delayed, and arbitration would be suspended (Tethyan Copper Co., 2010a, b; Mining Weekly, 2011; Antofagasta plc, 2013, p. 159; MacDonald, 2013; Balochistan Development Authority, 2014; Kiani, 2014).

In 2014, Lake Resources N.L. (Lake) of Australia entered into an exclusive agreement with Colt Resources Middle East (CRME) of the United Arab Emirates for the Chagai Hills project, which is located in Balochistan Province. The Chagai Hills project, for which Lake Resources was granted an exploration license in 2009, contains three exploration licenses—the Amalaf, the Dasht-i-Gauran, and the Koh-i-Sultan. The Amalaf project covers an area of 46.9 km^2 and is located on the northern boundary of the Saindak copper-gold mine; the Dasht-i-Gauran covers an area of 29.12 km^2 and is located west of the Reko Diq project; and the Koh-i-Sultan copper-gold deposit covers an area of 85.1 km^2 associated with intensively altered breccia and volcanics. Lake conducted drilling at Koh-i-Sultan in 2012. Drilling results included 14 meters (m) containing 2.20 g/t gold and 0.32% copper, and 10 m containing 2.96 g/t gold and 0.44% copper (Lake Resources N.L., 2014a, p. 1, 4, 6; 2014b, p. 2, 35).

Iron Ore and Iron and Steel.—According to the Ministry of Industries and Production, Pakistan Steel Mill Corp. (Pvt.) Ltd. (PSM) was the country's leading state-owned industrial complex in Pakistan in terms of steel output. PSM's capacity utilization decreased by 25% in May 2012 and by 19% in May 2013; by July 2013, PSM's capacity utilization decreased further by 12% owing to a shortage of coke feedstock, raw materials, and capital. PSM had a loss of $8.2 million (PKR86.27 billion)[1] in June 2013, and the loss increased to $9.4 million (PKR98.83 billion). The Government decided to privatize PSM and to sell 26% of its stake in the company. The Government also planned to introduce a voluntary separation plan at PSM to reduce the number of employees. PSM had about 4,800 employees in 2013; after layoffs, the total number would be 4,000 employees. In 2013, the Government approved a plan for the reconstruction of PSM. The Government of Russia expressed interest in investing $1 billion to modernize the complex and to increase PSM's production capacity. After modernization, the production capacity was expected to increase to 1.5 Mt/yr or possibly to 3 Mt/yr from the current 1.1 Mt/yr. PSM had two furnaces with a total crude steel production capacity of 1.1 Mt/yr; however, the second furnace had not been operational for more than 1 year. In 2014, PSM received $178.6 million in bailout packages (could be cash, bonds, loans, or stocks) from the Government. As of October 2014, the PSM stopped crude steel production, and production was not expected to resume in the near future (Kiani, 2013; Ministry of Finance, 2013b, p. 35; Salman, 2013; Siddiqui, 2013; Metal Bulletin, 2014, p. 11).

Bolan Mining Enterprise (BME), which was one of the leading barite-producing enterprises in Pakistan, was a joint venture of the government of Balochistan and Pakistan Petroleum Ltd. (PPL) (50% each). BME had two iron ore mining licenses. The iron ore mines are located northwest of the Nokkundi region of Balochistan Province. POSCO of the Republic of Korea and Al-Ittifaq Steel Production Co. (ISPC) of Saudi Arabia signed a memorandum of agreement with the Government of Pakistan for the development of the Nokkundi iron ore deposit. BME planned to set up a beneficiation plant with a production capacity of 1 Mt/yr of iron ore concentrates. The beneficiation plant was expected to begin production by 2015 or 2016 (Bolan Mining Enterprise, 2013; Pakistan Petroleum Ltd., 2013, p. 60; 2014b).

Lead and Zinc.—Since 2012, production at the Duddar zinc-lead mine, which is located in the Lasbella District in Balochistan Province, was suspended owing to maintenance of the site and underground system. The Duddar zinc-lead mine was a joint venture project between MCC (75%) and the Pakistan Mineral Development Corp. (PMDC) and the government of Balochistan Province (25%). In July 2014, China Huaye Group Co. Ltd. of China (a subsidiary of Metallurgical Corp. of China) won a bid for the Duddar zinc-lead mine project and began repair and maintenance of onsite equipment (table 2; Metallurgical Corporation of China Ltd., 2012, p. 23; 2013, p. 19; 2014, p. 22).

Industrial Minerals

Cement.—Cement played an important role in Pakistan's manufacturing sector. In 2014, D.G. Khan Cement Co. Ltd., Fauji Cement Co. Ltd., and Lucky Cement Ltd., started using biofuels for operations as an energy source, and Bestway Cement Ltd. of the United Kingdom, Cherat Cement Co. Ltd., D.G. Khan Cement, Fecto Cement Ltd., and Lucky Cement also installed heat recovery plants to generate their own electricity (table 2; Ministry of Finance, 2014b, p. 52). Demand for cement increased by 3% in 2014 and was expected to increase by 1 Mt/yr for the next 5 years owing to the World Bank Group's Board of Executive Directors's approval of financing from the International Development Association for the development of the Dasu Hydropower stage-1 construction project (DHP–1). The total cost of constructing the dam was estimated to be $4.8 billion. Cement for the project was expected to be provided by the following cement companies: Bestway Cement, Cherat Cement, D.G. Khan Cement, Fauji Cement, Fecto Cement, and Maple Leaf Cement Factory (Global Cement, 2014d; World Bank Group, 2014).

D.G. Khan Cement produced 3.6 Mt of clinker and 3.99 Mt of cement in 2014 compared with 3.9 Mt of clinker and 4.03 Mt of cement in 2013. D.G. Khan Cement was planning to start construction of a new cement plant at Hub in Balochistan Province with a production capacity of 2 to 2.5 Mt/yr. The cost of the construction was estimated to be $250 million. The plant was expected to start operations in 2018 (D.G. Khan Cement Co. Ltd., 2014, p. 26; Global Cement, 2014e).

The merger of the Farooqia plant of Pakistan (formerly Mustehkam Cement Ltd.) and Bestway Cement was approved in May 2013 under the name Bestway Cement Ltd. (a subsidiary of Bestway Group). The purpose of the merger was to reduce administrative, marketing, and procurement costs. Before the merger, Bestway Cement owned two cement plants with production capacities of 1.23 Mt/yr and 3.6 Mt/yr, respectively, which were located near the village of Tatral in Chakwal District, Punjab Province. The Farooqia plant's production capacity was 1.09 Mt/yr. After the merger, the combined production capacity of Bestway Cement increased to 6 Mt/yr. In 2014, Bestway Cement acquired an 87.93% share of Lafarge Pakistan Cement Ltd.'s cement plant in Chakwal District, which had a production capacity of 2.5 Mt/yr. The total production capacity of Bestway Cement after acquiring the Lafarge cement plant was 8 Mt/yr (Bestway Cement Ltd., 2013, p. 1, 2; Cemnet, 2013; Global Cement, 2014a).

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[1] Where necessary, values have been converted from Pakistani rupees (PKR) to U.S. dollars (US$) at an average rate of PKR105.15=US$1.00 for 2013

In 2014, Cherat Cement planned to invest $197 million to construct a new production plant at Nowshera in Khyber Pakhtunkhwa Province with a production capacity of 1.3 Mt/yr. The plant was expected to start operations in 2016 (Global Cement, 2014b).

Mineral Fuels and Related Materials

Coal.—According to the Lahore Chamber of Commerce and Industry, coal resources in Pakistan were estimated to be 186 billion metric tons (Gt), including 175 Gt of resources at the Thar coalfields. In 2014, coal production in Pakistan decreased by 3%. In 2013, the major consumers of coal in the country were the cement sector, which accounted for 58% of total coal consumption, and brick kilns, which accounted for 41% of total coal consumption. The increase in coal consumption by cement plants was attributed to their transition to coal from natural gas. In 2014, development of the Thar (a lignite coalfield) was an important project for the Government because it would improve the country's energy security (Ministry of Finance, 2013a, p. 193; 2014a, p. 244; Daily Times, 2014).

Oracle Coalfields plc of the United Kingdom acquired a 30-year mining license for Block IV of the Thar lignite coalfield; it covers an area of 66.1 km^2 and is located in Sindh Province in southeastern Pakistan. The drilling results of Block IV indicated 1.4 Mt of in situ coal. According to the Joint Ore Reserve Committee (JORC)-compliant assessment, the resources (including measured, indicated, and inferred) were estimated to be 529 Mt and the proven reserves were estimated to be 113 Mt. In September, Oracle Coalfields signed a joint-development agreement with China Engineering Co. for the development of the proposed mine in Block IV. In November, Oracle Coalfields signed a memorandum of understanding with Solar Electric Power Co. (SEPCO) of China for the development of a 600-MW-capacity powerplant and with Lucky Cement and Thatta Cement Co. Ltd. for coal supply. Oracle Coalfields conducted a technical feasibility study, which indicated the possibility of open pit mining with a capacity of 5 Mt/yr of coal. The company signed an Engineering Procurement and Construction (EPC) framework agreement with SEPCO for the construction of a 600-MW-capacity powerplant and development of a 4-Mt/yr-capacity open pit mine. In 2014, Sindh Carbon Energy Ltd. was notified that the mining licenses for Block IV had been canceled; no explanation for the cancellation was provided (Oracle Coalfields plc, 2013, p. 2–3, 6; 2014a, p. 2; 2014b, p. 3).

In May 2012, United Coal Holdings Ltd. of Canada (formerly Copper Minerals Inc. of Canada), through its subsidiary AJK Mining Company (Pvt.) Ltd., acquired a coal property in the Kotli coal district in the States of Azad Jammu and Kashmir (AJK). United Coal Holdings held a 60% interest in the coal property, which is located within the Navel and Planna areas and the village of Karjai in the Tehsil and Kotli Districts of AJK. By October 2012, the company had extracted 492 t of coal for the trial, and sold it to local cement companies. In November 2013, the company slowed down the exploration drilling owing to limited funding. Reserves had not been estimated for the property. The mining licenses held by AJK Coal Mining Co. (Pvt.) Ltd., which had been established for exploration and development of the area, expired. The application to renew the exploration license was filed, and final approval was pending (InfoMine, 2013, p. 1–3; United Coal Holdings Ltd., 2014a; 2014b, p. 2–3).

Natural Gas and Crude Oil.—Pakistan's energy sectors and industries were heavily dependent on natural gas and crude oil. In 2013, power shortages took place owing to a minimal increase in the supply of natural gas, which continued in 2014. Natural gas and petroleum were produced by PPL, OGDCL, POL, and OPL (Ministry of Finance, 2013a).

In 2014, PPL's shareholding was divided between the Government (68%), private investors (25%), and PPL Employees Empowerment Trust (7%). In 2014, PPL operated six producing natural gas fields, including Adhi, Chachar, Hala, Kandhkot, Mazarani, and Sui, and had a working interest in 11 other partner-operated producing fields. Total production from PPL's wholly owned fields and joint-venture-operated fields was 8.8 million cubic meters of natural gas and 3.8 million barrels (Mbbl) of crude oil. The recoverable reserves of the Sui natural gas field were depleted; it was estimated to be 3.9 million cubic meters in 2014 compared with 4.5 million cubic meters in 2013. The mining license for the Sui natural gas field was expected to expire in 2015. Natural gas from the Kandhkot natural gas field was used at the Gudu thermal powerplant. The recoverable reserves at the Kandhkot natural gas field were estimated to be 152.9 million cubic meters of natural gas and 18 billion barrels of condensate. The Mazarani natural gas field, which was a joint venture between PPL (87.5%) and Government Holdings (Pvt.) Ltd. (GHPL) (12.5%), had recoverable reserves estimated to be 1.2 billion cubic meters of natural gas and 0.22 million barrels of condensate. In 2014, four wells were drilled in the Mazarani natural gas field, and only three wells were in operation. The Adhi natural gas field was a joint venture of PPL (operator) (39%), OGDCL (50%), and POL (11%). The recoverable reserves of the Adhi natural gas field were estimated to be 1.3 billion cubic meters of natural gas and 6 Mbbl of natural gas liquids (NGLs). As of 2014, 12 wells were operating at the Adhi natural gas field. The engineering, procurement, construction, and commissioning contract was signed in 2014 for the construction of a 310-million-cubic-meter-per-year liquefied petroleum gas (LPG) and NGL plant (Plant-III). The plant was expected to be operational in 2015. The Chachar natural gas field, which was a joint venture between PPL (75%) and the GHPL (25%), had recoverable reserves estimated to be 9.3 billion cubic meters of natural gas. As of 2014, the Chachar 1 and Chachar 2 wells were in production, and the Chachar 3 and Chachar 4 wells were abandoned owing to water load-up. Production from the Chachar natural gas field declined to 9.3 million cubic meters per day in 2014. In 2014, the Hala natural gas field, which was a joint venture between PPL (65%) and Mari Petroleum Co. Ltd. (MPCL) (35%), produced natural gas, condensate, and LPG from the Adam-X1 well under extended well testing. The Hala plant was recommissioned in 2014; the second well was spud and drilling was in progress, and exploratory drilling for the third well was planned to start in 2015. PPL announced a natural gas and condensate discovery at the Shraft X–1 well in Sanaghar District. Two additional zones were identified and were expected to be tested; the cumulative production was expected to be 2.7 million barrels per year (Pakistan Petroleum Ltd., 2014a, p. 41–43; 2014c, d).

In 2014, OGDCL produced 15.1 Mbbl of crude oil and 12.1 million cubic meters of natural gas. In 2013, OGDCL discovered natural gas and gas condensate during exploration of the Saand Well 01 in the Tando Allah Yar District and the Maru East-1 well in Ghotki District in Sindh Province. The test for hydrocarbon potential of the Low Gory Formation at Saand Well 01 yielded 60.4 million cubic meters per year of natural gas and 23,725 barrels per year of condensate. In 2014, OGDCL continued exploration at both areas (Oil and Gas Development Co. Ltd., 2013a, p. x; 2013b; 2014, p. ii, 2, 31).

Outlook

The power and industrial sectors of Pakistan are heavily dependent on natural gas and coal. The Government is actively trying to increase the energy supply in the country by awarding petroleum exploration licenses, developing coalfields, and approving the use of grid-connected solar energy, installation of rooftop solar panels, and mortgage financing for the installation of solar panels on homes. Construction of the Dasu dam and improvements in infrastructure are likely to increase cement production during the next 5 years. Steel and metal production, however, are likely to continue to decrease owing to aging technology and a lack of funding and new investments at production facilities. Pakistan's GDP is expected to increase by 4.2% in 2015 (Asian Development Bank, 2015, p. 170).

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TABLE 1
PAKISTAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2010	2011	2012	2013	2014
METALS						
Antimony		25	--	12	89	127
Bauxite, gross weight		9,031	9,033	30,223	25,288	31,156
Chromium ore:						
Gross weight		232,000 [r]	134,000 [r]	207,000 [r]	96,000 [e]	69,000
Cr_2O_3 content		104,000 [r]	60,000 [r]	93,000 [r]	43,000 [r]	31,000
Copper, mine output, Cu content		18,805 [r]	18,016 [r]	19,211 [r]	13,500	13,122
Iron and steel:						
Iron ore, gross weight	thousand metric tons	418	430	384	412	255
Fe content, 32%	do.	134	138	123	132	82
Pig iron	do.	415 [r]	358 [r]	198 [r]	165 [r]	142
Steel, crude	do.	800 [r]	850 [r]	850 [r]	972 [r]	900 [e]
Lead, refined, secondary[3]		2,522 [r]	2,268 [r]	-- [r]	-- [r]	--
Zinc, Zn content[3]		21,812 [r]	19,457 [r]	-- [r]	-- [r]	--
INDUSTRIAL MINERALS						
Barite		57,000	32,000	49,000	118,000	131,000
Cement, hydraulic	thousand metric tons	31,358	28,716	29,557	31,098	31,960
Silica sand		369,000 [r]	262,000 [r]	348,000 [r]	301,000 [r]	222,000
Chalk		1,322	1,422	1,500	1,600	1,000
Clays:						
Bentonite		34,596 [r]	30,840 [r]	16,520	22,000 [r]	43,000
Fireclay		329,055	274,042	408,000 [r]	410,000 [r]	450,000
Fuller's earth		11,210 [r]	4,200 [r]	6,906	4,000 [r]	8,000
Kaolin, china clay		22,000 [r]	14,000 [r]	23,000 [r]	20,000 [r]	13,000
Feldspar		54,198 [r]	23,254 [r]	53,235	38,218	81,858
Fluorspar		290	3,156 [r]	6,859 [r]	8,000 [e, r]	8,938
Gypsum, crude		742,000 [r]	1,164,000 [r]	1,276,000 [r]	1,229,000 [r]	1,436,000
Magnesite, crude		5,159	4,908	5,444	6,705	3,730
Nitrogen, N content of ammonia		2,800	2,700	2,300	2,700	2,600
Phosphate rock:						
Gross weight		87,807	30,950	69,400	104,961 [r]	89,000
P_2O_5 content		15,800	5,567	12,484	47,272 [r]	16,000
Pigments, mineral, natural, ocher		55,352	36,078 [r]	42,107 [r]	37,769 [r]	32,634
Salt:						
Marine	thousand metric tons	190	315	292	297	300
Rock	do.	1,941 [r]	2,173 [r]	2,091 [r]	2,263 [r]	2,241
Total	do.	2,131 [r]	2,488 [r]	2,383 [r]	2,560 [r]	2,541
Sand and gravel		37,604	38,215	--	381,863 [r]	387,971
Sodium compounds, n.e.s.:[4]						
Caustic soda		173 [r]	144 [r]	192 [r]	172 [r]	166
Soda ash, manufactured		393 [r]	372 [r, 3]	367 [r]	379 [r]	437
Stone:						
Dolomite	thousand metric tons	130,000	240	198	219	600
Limestone	do.	34,049 [r]	33,900 [r]	38,803 [r]	36,133	36,133
Marble	do.	1,065 [r]	1,133 [r]	1,751 [r]	2,360 [r]	2,057
Strontium minerals, celestite		160	--	--	--	--
Sulfur, native		27,100	28,000	26,000	21,000	30,000
Talc, and related materials, soapstone		121,800	114,100	110,000	93,214	70,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite, bituminous	thousand metric tons	3,367 [r]	3,207 [r]	3,378 [r]	2,985 [r]	3,085
Coke	do.	343	302	193	203	113

See footnotes at end of table.

TABLE 1—Continued
PAKISTAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2010	2011	2012	2013	2014
MINERAL FUELS AND RELATED MATERIALS—Continued						
Gas, natural:						
Gross production	million cubic meters	42,362 [r]	42,362 [r]	43,806 [r]	42,617 [r]	41,937
Marketed production, sales[e]	do.	40,400 [r]	40,400 [r]	47,800 [r]	40,600 [r]	40,000
Petroleum:						
Crude	thousand 42-gallon barrels	23,874 [r]	23,724 [r]	26,135 [r]	29,489 [r]	34,232
Refinery products:						
Gasoline	do.	11,532 [r]	10,667 [r]	10,612 [r]	12,936 [r]	12,547
Jet fuel	do.	7,570 [r]	6,631 [r]	5,600 [r]	6,000	6,394
Kerosene	do.	1,082 [r]	903 [r]	987 [r]	1,131 [r]	1,141
Distillate fuel oil	do.	32,000	24,550 [r]	24,271 [r]	29,084 [r]	31,986
Residual fuel oil	do.	20,000	16,146 [r]	14,360 [r]	17,472 [r]	17,347
Lubricants	do.	1,393	1,393 [r]	1,473 [r]	1,414 [r]	1,348
Liquefied petroleum gas	do.	2,306	2,159 [r]	2,149 [r]	2,645 [r]	2,311
Other	do.	17,000	6,643 [r]	5,832 [r]	5,674 [r]	6,280
Total	do.	19,306 [r]	8,802 [r]	7,981 [r]	8,319 [r]	8,591
Uranium, processed:						
U_3O_8 content		38	38	38	38	38
U content		45	45	45	41 [r]	45

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. -- Zero.

[1] Table includes data available through September 4, 2015.

[2] In addition to the commodities listed, abrasives, secondary aluminum, emery, and natural gas liquids were produced but information was not adequate to make reliable estimate of output. The Saindak copper mine produced gold and silver.

[3] The Duddar lead-zinc mine project was suspended in 2012 and continued to be on care-and-maintanance status owing to site maintenance and maintenance of the underground system.

[4] Not elsewhere specified.

TABLE 2
PAKISTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Aluminum smelters, secondary		Canon Metal Works	Gujranwala	NA
Do.		H. Gulam Qadir & Sons	do.	NA
Do.		M. Siraj Din Mohammed Shafi	do.	NA
Do.		Punjab Metal Works	do.	NA
Do.		Noor Aluminium Co.	Karachi	NA
Do.		Standard Aluminium	do.	NA
Do.		Aluminum Co. of Pakistan Industries (Pvt) Ltd.	do.	1,500
Do.		Japan Metal Industries	do.	1,500
Do.		Khan Aluminum Industries	do.	2,700
Do.		Kruddson Pvt Ltd.	do.	1,200
Do.		Lucky Industries	do.	1,200
Do.		Pakistan Cabled Ltd.	do.	2,500
Do.		Pakistan Metal Industries	do.	4,000
Do.		Chawala Chemical & Metal Industries	Lahore	NA
Do.		Aluminum Co. of Pakistan Industries (Pvt) Ltd.	do.	1,200
Do.		Alpha Aluminium Co.	do.	1,100
Do.		Chauhan Industries	do.	120
Do.		China Industries	do.	150
Do.		Craft Aluminium	do.	300
Do.		Khuram Industry	do.	300
Do.		Pakistan Alco Products	do.	NA
Do.		Shaheen Industries	do.	NA
Do.		Sana Aluminium Industries	Peshawar	NA
Do.		Hyder Industries	Sahiwal	NA
Do.		Jilani Industries	do.	NA
Antimony		MTEQ Pakistan (Pvt.) Ltd.	Vashouk and Dalbadin, Balochistan	12,000
Barite		Bolan Mining Enterprises, Government of Balochistan, 50%, and Pakistan Petroleum Ltd. (PPL), 50%	Khuzdar, Balochistan Province	437,000
Do.		Razvi Mining (Pvt.) Ltd.	Gandori, Kalan, and Retri	30,000
Bauxite		MTEQ Pakistan (Pvt.) Ltd.	Warehouses in Karachi	NA
Cement	thousand metric tons	Power Cement Ltd. (Arif Habib Group)	Arif Habib Centre, Karachi	600
Do.	do.	Askari Cement Co. Ltd.	Nizampur and Wah	9
Do.	do.	Falcon Cemnent/Attock Cement Pakistan Ltd.	Hub Chowki, Karachi	1,710
Do.	do.	Bestway Cement Co. Ltd.	Chakwal and 2 plants in Hattar; Lafarge plant in Chakwal District	8,000
Do.	do.	Cherat Cement Co. Ltd.	Nowshera	900
Do.	do.	Dandot Cement Co. Ltd.	Dandot	40
Do.	do.	Dewan Cement Ltd. (A Yousuf Dewan Co.)	Hattar and Dhabeji	800
Do.	do.	Fauji Cement Co. Ltd.	Jhang Bahtar, Attock District	3,000
Do.	do.	Fecto Cement Ltd.	Sangjani	900
Do.	do.	Gharibwal Cement Ltd.	Jhelum	2,500
Do.	do.	Javedan Cement Ltd.	Karachi	600
Do.	do.	D.G. Khan Cement Co. Ltd.	Dera Ghazi Khan and Khairpur Districts	4,000
Do.	do.	Kohat Cement Co. Ltd.	Kohat District	3,000
Do.	do.	Lucky Cement Ltd.	Indus Highway, Karachi	8,000
Do.	do.	do.	Pezu	4,000
Do.	do.	Maple Leaf Cement Factory Ltd.	Daudkhel	3,400
Do.	do.	Pioneer Cement Ltd.	Chenki	1,300
Do.	do.	Thatta Cement Co. Ltd. (Arif Habib Group)	Thatta	500
Do.	do.	Zeal Pak Cement Factory Ltd.	Hyderabad	1,100
Do.	do.	Flying Cement	Lilla, Mangowal, Khushab District, Punjab Province	1,300
Do.	do.	A.C. Rohi Cement Ltd.	Den Nando Kohistan, Sindh Province	NA
Do.	do.	Dadabhoy Cement Industries Ltd. (M.H. Dadabhoy Group)	Dadu, Karachi, Sindh Province	2,800
Do.	do.	Flying Cement	Lilla, Mangowal, Khushab District, Punjab Province	1,300

See footnotes at end of table.

TABLE 2—Continued
PAKISTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity^e
Cement—Continued	A.C. Rohi Cement Ltd.	Den Nando Kohistan, Sindh Province	NA
Do. thousand metric tons	Dadabhoy Cement Industries Ltd. (M.H. Dadabhoy Group)	Dadu, Karachi, Sindh Province	2,800
Chromite	Pakistan Chrome Mines Ltd.	Gwal, Khanozai, Muslim Bagh, and Nisai, Balochistan Province	20,000
Do.	Ghani Corp. [Ghani Mines (Pvt.) Ltd.]	NA	NA
Do.	Svah Resources Inc.	Muslim Bagh and Khanozai	180,000
Do.	MTEQ Pakistan (Pvt.) Ltd.	Dargai and Malakand	120,000
Coal thousand metric tons	Sindh Coal Authority	Dadu, Sindh Province	4,000,000
Do.	do.	Tharparkar, Sindh Province	NA
Do. thousand metric tons	Lakhra coal fields, Pakistan Mineral Development Corp., 50%; government of Sindh Province, 25%; Water and Power Development Authority, 25%	Latifabad, Hyderabad	201,000
Do.	Lakhra Coal Development Co.	Khanot near Lakhra	NA
Do. thousand metric tons	Degari-Sor-Range (Pakistan Mineral Development Corp.) (Government, 100%)	35 kilometers southeast of Quetta	3,000
Do. do.	Degari-Sor-Range (Pakistan Mineral Development Corp.) (Government, 100%)	16 kilometers east of Quetta	29,000
Do. do.	Shahrig-Khost-Harnai Coal field (Pakistan Mineral Development Corp.) (Government, 100%)	160 kilometers northeast of Quetta	159,000
Do.	Progressive Mining Enterprise (Ghani Mines Ltd.)	Takwan, Chakwal District	NA
Do.	Ghani Corp. (Ghani Mines Ltd.)	NA	NA
Do.	Al-Muhandus Corp. (Ghani Mines Ltd.)	Balman and Chukki, Quaidabad, Khushab District	NA
Do.	Nara Minerals [Chani Mines (Pvt.) Ltd.]	Patala Formation, Jhelum District	NA
Copper, mine	Saindak Metals Ltd. (Metallurgical Corp. of China Ltd.)	Chagai Hills, Balochistan Province	NA
Copper, manufacturing	MTEQ Pakistan (Pvt.) Ltd.	Gilgit and Balistan	NA
Fertilizer	Engro Fertilizer Ltd.	Daharki	2,000
Do.	Fatima Fertilizer Company Ltd.	Sadiqabadm Rahim Yar Khan	500,000
Do.	Pakarab Fertilizer Ltd.	Khanewal Road, Multan	NA
Do.	Fauji Fertilizer Bin Qasim Ltd.	Bin Qasim, Karachi	1,000
Gas, natural million cubic meters	Pakistan Petroleum Ltd. (PPL) (Government, 68%; PPL Employees Empowerment Trust, 7%; private investors, 25%)	Adhi, Punjab Province; Kandhkot and Mazarani, Sindh Province; and Sui, Balochistan Province	8,400
Do. do.	Oil and Gas Development Co. Ltd. (OGDCL) (Government, 74.97%)	37 oilfields and gasfields, including Mari, Sindh Province	11,315
Do. do.	Pakistan Oilfields Ltd. (POL)	15 oilfields and gasfields	730
Do. do.	Mari Petroleum Co. Ltd.	Mari gasfield, Daharki and 14 oilfields and gasfields	850
Do.	Ocean Pakistan Ltd.	Punjab, Balochistan, Khyber Pakhtunkhawa, and Islamabad Provinces	NA
Gold, Ag content	Saindak Metals Ltd. (Metallurgical Corp. of China Ltd.)	Chagain Hills, Balochistan Province	NA
Iron ore	Mines and Minerals Enterprises Pakistan	Punjab Province	NA
Lead and zinc, ore	Metallurgical Corp. of China Ltd., 75%, and Pakistan Mineral Development Corp. and Government of Pakistan, 25%	Duddar lead-zinc mine project,[1] Duddar, Balochistan Province	131,000
Marble (onyx)	Azeem Marble & Onyx Industries	Karachi	NA
Phosphate rock	Pakistan Mining Co. Ltd.	NA	90,000
Salt	Khewra Salt Mines (Pakistan Mineral Development Corp.) (Government, 100%)	Salt Range, south of Islamabad	435,000
Do.	Warcha Salt Mines (Pakistan Mineral Development Corp.) (Government, 100%)	276 kilometers from Islamabad	613,000
Do.	Kalabagh Salt Mines (Pakistan Mineral Development Corp.) (Government, 100%)	296 kilometers from Islamabad and 50 kilometers from Mainwali	80,000

See footnotes at end of table.

TABLE 2—Continued
PAKISTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Salt—Continued		Jatta Salt Mines (Pakistan Mineral Development Corp.) (Government, 100%)	217 kilometers from Islamabad and Kohat	73,000
Do.		Bahadur Khel Salt Mines (Pakistan Mineral Development Corp.) (Government, 100%)	265 kilometers from Islamabad and 112 kilometers from Kohat	NA
Do.		Ghani Corp. (Ghani Mines Ltd.)	Banda Daud Shah, Karak District	NA
Do.		Nara Minerals [Chani Mines (Pvt.) Ltd.]	Central Part of Salt Range	NA
Do.		Ghani Mines	Korrian	NA
Do.		Al-Muhandus Corp. [Chani Mines (Pvt.) Ltd.]	Salt Range, near village Choa, Warcha, Quaidabad, Khushab District	NA
Silica sand		Ghani Corp. [Ghani Mines (Pvt.) Ltd.]	NA	NA
Do.		MTEQ Pakistan (Pvt.) Ltd.	NA	120,000
Soda ash		ICI Pakistan Ltd.	Khewra, Punjab Province	350,000
Steel, crude	thousand metric tons	Pakistan Steel Mills Corp. (Pvt) Ltd. (PSM)	Karachi	1,100
Sulfur		Pakistan Oilfields Ltd. (POL)	15 oilfields and gasfields	NA
Talc		CapriCorn Minerals	Bandi Sadique	20,000
Petroleum:				
Crude	thousand 42-gallon barrels	Mari Petroleum Co. Ltd.	Sindh Province	6,000
Do.	do.	Pakistan Petroleum Ltd. (PPL) (Government, 68%; PPL Employees Empowerment Trust, 7%; private investors, 25%)	Adhi, Punjab Province (additional 10 blocks)	1,600
Do.	do.	Oil and Gas Development Co. Ltd. (OGDCL), (Government, 74.97%)	Balochistan, Punjab, and Sindh Provinces	11,500
Do.	do.	Pakistan Oilfields Ltd. (POL)	Balochistan Province	8,000
Do.		Ocean Pakistan Ltd.	Punjab, Balochistan, Khyber Pakhtunkhawa, and Islamabad Provinces	NA
Refined	thousand 42-gallon barrels	Bosicor Pakistan Ltd.	Karachi	10,700
Do.	do.	Pak-Arab Refinery Co. Ltd. (joint venture of the governments of Pakistan and the Emirate of Abu Dhabi)	Mahmood Kot, Punjab Province	360,000
Do.	do.	Attock Refinery Ltd.	Rawalpindi	16,000
Do.	do.	Pakistan Refinery Ltd.	Karachi	17,000
Do.	do.	Pakistan Mining Co. Ltd.	NA	90,000
Do.	do.	National Refinery Ltd.	NA	NA

[e] Estimated. Do., do. Ditto. NA Not available.

[1] The Duddar lead-zinc mine project was suspended in 2012, and the underground system continued to be on care-and-maintenance status.

THE MINERAL INDUSTRY OF PAPUA NEW GUINEA

By Sean Xun

Papua New Guinea is located along the collision zone between the continental crust of the Australian Plate to the south and the oceanic crust of the Pacific Plate to the north. The country is a highly prospective region for a number of types of mineralization, including epithermal and porphyry-related high- and low-sulfidation systems, skarns, volcanogenic massive sulfides, exhalative manganese deposits, lateritic nickel-chromite-cobalt, and sea-floor massive sulfides. In 2014, Papua New Guinea produced a variety of metallic minerals, such as cobalt, copper, gold, nickel, and silver, as well as such mineral fuels as crude petroleum and natural gas. The Papua New Guinea liquefied natural gas (LNG) project, with an estimated construction cost of about $19 billion, started production in early 2014 (table 1; Mineral Resources Authority, 2012, p. 1; Bank of Papua New Guinea, 2015a, p. 30).

Minerals in the National Economy

The rate of growth of Papua New Guinea's real gross domestic product (GDP) was estimated to be 8.4% in 2014 compared with 5.5% in 2013. The rate of growth of the nonmining GDP (all economic sectors except mining) was 1.4% in 2014 compared with 4.9% in 2013. The strong growth in the domestic economy in 2014 was attributed mainly to the starting of production and the exporting of commodities at the LNG plant, which was supported by improvement in international prices for most of Papua New Guinea's export commodities. The mineral sector accounted for 87.4% of the total foreign investment in Papua New Guinea in 2013 and 85.2% in 2014 (Bank of Papua New Guinea, 2015a, p. 2, 25; 2015b, p. 30, 31).

Government Policies and Programs

The Mineral Resources Authority (MRA) of Papua New Guinea, which was established through the enactment of the Mineral Resources Authority Act 2005 by Parliament, is the Government agency responsible for the development of mining in the country. Its responsibilities include ensuring that exploration and mining activities in Papua New Guinea are done within the regulatory and policy framework and that the benefits from these activities are being distributed fairly and transparently to all beneficiaries and stakeholders. The MRA also carries out earth-science research studies and processes field data to assist with and promote exploration, geologic research, and related activities in the mineral sector; and it coordinates the administration and management of all special projects, including ongoing development and support functions in the areas of project procurement, financial accounting, and management for projects with the European Union and the World Bank and other donor-funded projects. Laws that regulate the mining industry in Papua New Guinea include the Mining Act 1992, the Environment Act 2000, the Mineral Resource Authority Act 2005, the Mining (Safety) Act & Regulations 2007, and the Gold Export License Requirements. In April 2014, a contract to carry out an aerial geophysical survey near the Papua New Guinea and Indonesia border was signed between the MRA and GPX Surveys Ltd. of Australia. The purpose of the contract was to enhance geoscientific knowledge of the area between the Frieda River and the Ok Tedi prospects. When completed, the new data sets were expected to increase mineral exploration activity in the area (Mineral Resources Authority, 2014, p. 1; 2015a, b).

Production

Copper production decreased by 29% in 2014 compared with that of 2013 owing to decreased production at the Ok Tedi Mine. Nickel production (nickel content) increased by 85%, and cobalt production increased by 111% owing to increased production at the Ramu Mine. Marketable natural gas production increased by 60% owing to increased output at the LNG plant gasfields. Liquefied natural gas production at the LNG plant was about 4 million metric tons (Mt). In 2014, production of crude petroleum, gold, and silver was maintained at levels similar to those of 2013 (table 1; Highlands Pacific Ltd., 2015, p. 9; Oil Search Ltd., 2015, p. 73; Ok Tedi Mining Ltd., 2015, p. 83).

Structure of the Mineral Industry

Most of the mining facilities in Papua New Guinea were joint ventures between the Government and private international mining companies. Some mines were wholly owned by foreign entities, such as the Lihir gold mine, which was 100% owned by Newcrest Mining Ltd. of Australia. The Ok Tedi Mine became a state-owned enterprise in 2013; Papua New Guinea held an 87.8% interest, and the remaining interest was owned by the Fly River Provincial government. Table 2 is a list of the major mineral facilities operating in 2014 (Newcrest Mining Ltd., 2015, p. 15; Ok Tedi Mining Ltd., 2015, p. 18).

Mineral Trade

According to the Central Bank of Papua New Guinea, the total value of goods exported from the country in 2014 was $8.58 billion,[1] representing a 64% increase compared with that of 2013. The increase was mainly owing to the production and export of mineral commodities at the LNG project. The value of mineral exports from Papua New Guinea in 2014 was $6.94 billion, or 81% of the total value of exports, which was an 84% increase compared with that of 2013. The increase in value was owing to an increase in the production and export of LNG, condensates, and naphtha, and an increase in gold and nickel exports. LNG exports totaled $2.48 billion in 2014, which accounted for 29% of total exported goods. About 6.18 million barrels (Mbbl) of condensates, valued at

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[1] Where necessary, values have been converted from Papua New Guinean kina (PGK) to U.S. dollars (US$) at an average rate of PGK2.55=US$1.00 for 2014.

$550 million, were exported. As a result of these increases in the value of exports, the country recorded a trade account surplus of $5.05 billion in 2014 compared with a surplus of $468 million in 2013 (Bank of Papua New Guinea, 2015a, p. 14, 15).

The value of exported gold increased to $2.14 billion in 2014, or by 0.7% compared with that of 2013. Gold exports totaled 58,000 kilograms (kg), which was an increase of 5.5% compared with that of 2013. The increase in export volume was owing to increased production and shipments at the Hidden Valley, Porgera, and Tolukuma Mines and other licensed exporters, which more than offset lower production at the Lihir, Ok Tedi, and Simberi Mines. The average price of gold on the London Metal Exchange decreased by 10.4% in 2014 compared with that of 2013. The increase in Papua New Guinea's export volume was large enough to offset the decrease in the price of gold (Bank of Papua New Guinea, 2015a, p. 15).

According to the Central Bank of Papua New Guinea, copper exports totaled about 89,600 metric tons (t), which was a 3.6% decrease compared with that of 2013. The decrease in copper exports was owing mainly to decreased production and metal ore grades from the Ok Tedi Mine. The average price of copper exports from Papua New Guinea increased by 2.7% in 2014 compared with that of 2013. As a result, the total value of copper exports decreased to about $591 million, or by 0.9% compared with that of 2013 (Bank of Papua New Guinea, 2015a, p. 15).

Nickel exports totaled about 20,900 t in 2014, which was a 31.4% increase compared with that of 2013. The increase in nickel exports was mainly owing to increased production from the Ramu nickel-cobalt mine. The average price of nickel exports from Papua New Guinea increased by 6.9% in 2014 compared with that of 2013. As a result, the total value of nickel exports increased to about $289 million, or by 73.2% compared with that of 2013 (Bank of Papua New Guinea, 2015a, p. 15).

Cobalt exports totaled about 2,100 t in 2014, which was a 50% increase compared with that of 2013. The average price of cobalt exports from Papua New Guinea decreased by 42.2% in 2014 compared with that of 2013 owing to the weak demand from China. As a result, the total value of cobalt exports decreased to about $44 million, or by 13.3% compared with that of 2013 (Bank of Papua New Guinea, 2015a, p. 15).

Crude oil exports totaled about 8.2 Mbbl in 2014, which was a decrease of 1.1% compared with that of 2013. The decrease in crude oil exports was owing to decreased extraction rates caused by the decline in reserves at the Kutubu, the Gobe Main, the South East Gobe, and the Moran oilfields. The average price of crude oil exports from Papua New Guinea increased by 3.9% in 2014 compared with that of 2013. The decrease in the price per barrel of crude oil was attributed to the depreciation of the Papua New Guinea kina against the U.S. dollar. The value of crude oil exports was about $817 million in 2014, representing a 2.8% increase compared with that of 2013 (Bank of Papua New Guinea, 2015a, p. 15–16).

Commodity Review

Metals

Cobalt and Nickel.—The Ramu Mine (also known as the Kurumbukari, the Kurbukan, or the Ramu River Mine) was built at a cost of $2.1 billion and was commissioned progressively beginning in 2012. This nickel-cobalt mine, which is located near Madang on the north coast of Papua New Guinea, was one of the largest mining and processing projects to have been brought into production in Papua New Guinea during the past decade. At yearend 2014, production reached 72% of nameplate capacity. The Ramu open pit mine was connected by a 135-kilometer (km) slurry pipeline to the Basamuk processing plant, which is located 75 km east of the Provincial capital city of Madang in the Rai Coast District (Highlands Pacific Ltd., 2015, p. 8, 9).

In 1996, the Ramu nickel joint venture was established to prepare an economic feasibility study for the project. A special mining license for the project was granted in 2000, and, in 2005, the Metallurgical Corporation of China Ltd. (MCC) joined the joint venture and was responsible for financing and construction of the project. As of yearend 2014, the following entities owned an interest in the Ramu nickel-cobalt project—MCC Ramu NiCo Ltd. (85%), Highlands Pacific Ltd. of Australia (8.6%), and the Papua New Guinea Government and landowners (6.4%). Highlands announced that its share in Ramu would increase to 11.3% after an unspecified amount of internal project debt had been repaid from operating revenue, and it had an option to increase its interest to 20.6%. MCC held a 61% interest in MCC Ramu NiCo Ltd. and a number of other Chinese entities held the remaining 39%. MCC was responsible for the operation of the mine (Highlands Pacific Ltd., 2015, p. 9).

The Ramu Mine is a low-strip-ratio open pit mine. Face shovels and backhoe configured excavators were used to mine the 12-meter (m)-thick, on average, ore body and load the ore onto trucks for delivery to the washing plant and then to the beneficiation plant. Treatment would remove the chromite and create a slurry feed for overland pipeline transport to the Basamuk processing plant, which had the capacity to produce 78,000 metric tons per year (t/yr) of nickel-cobalt mixed hydroxides containing 31,150 t of nickel and 3,300 t of cobalt (Highlands Pacific Ltd., 2015, p. 9).

In 2014, a total of 6.0 Mt (wet) of ore was mined compared with 3.48 Mt in 2013. About 2.27 Mt (dry) of ore was processed in 2014 compared with 1.25 Mt in 2013. Production of mixed hydroxide precipitate (MHP) was 57,360 t in 2014 compared with 29,736 t in 2013. The MHP contained 20,987 t of nickel metal in 2014 compared with 11,369 t in 2013, and 2,134 t of cobalt metal in 2014 compared with 1,013 t in 2013. According to the company, the throughput was expected to increase to 83% of full capacity in 2015 and to reach full capacity in 2016. The nameplate capacity of the project was 8.5 million metric tons per year (Mt/yr) of mined ore (wet), 3.4 Mt/yr of processed ore (dry), and 78,000 t/yr of MHP (dry). The project had a planned mine life of more than 20 years and an expected production cost of about $10,000 per metric ton of nickel at full capacity (Highlands Pacific Ltd., 2015, p. 9).

As of yearend 2014, the resources at the Kurumbukari Mine included 38 Mt of measured resources grading 0.9% nickel and 0.1% cobalt; 7 Mt of indicated resources grading 1.4% nickel and 0.1% cobalt; and 4 Mt of inferred resources grading 1.2% nickel and 0.1% cobalt. The resources at the Ramu West deposit included 17 Mt of indicated resources grading 0.8% nickel and

0.1% cobalt and 3 Mt of inferred resources grading 1.5% nickel and 0.2% cobalt. The resources at the Greater Ramu deposit included 60 Mt of inferred resources grading 1.0% nickel and 0.1% cobalt. The reserves at the Kurumbukari Mine included 33 Mt of proved reserves grading 0.9% nickel and 0.1% cobalt and 6 Mt of probable reserves grading 1.4% nickel and 0.1% cobalt. The reserves at the Ramu West deposit included 14 Mt of probable reserves grading 0.9% nickel and 0.1% cobalt. The total reserves at the Kurumbukari Mine were 39 Mt in 2014 compared with 42 Mt in 2013, reflecting depletion of the mined areas (Highlands Pacific Ltd., 2015, p. 13–14).

Copper.—Ok Tedi Mining Ltd. (OTML) was a state-owned company that operated the Ok Tedi Mine (also known as the Mt. Fubilan Mine), which is located within Mt. Fubilan in a region of steep cliffs known as the Hindenburg Wall in the rainforest of Papua New Guinea's Western Province approximately 16 km east of the border with Indonesia. The deposit was mined as a large open pit with a 23-Mt/yr flotation processing plant. Copper concentrate was transported 156 km south to the Kiunga port facilities, which are located on the Fly River; there, the concentrate was dried, stored, and then shipped by barge down the Fly River to Port Moresby to a silo and storage vessel, prior to export to overseas customers (Ok Tedi Mining Ltd., 2015, p. 26).

In 2014, 15.9 Mt of ore was mined at the Ok Tedi Mine and 52.1 Mt of waste rock was moved. More than 16.8 Mt of ore was processed, resulting in 308,387 t of concentrate containing 75,901 t of copper, 7,497 kg of gold, and 18,504 kg of silver. The sales of copper, gold, and silver concentrate totaled $956 million. In 2013, the company mined 62.8 Mt of ore and waste rock. More than 19.6 Mt of ore was processed, resulting in 415,713 t of concentrate containing 105,523 t of copper, 11,346 kg of gold, and 29,875 kg of silver. The sales of copper, gold, and silver concentrate totaled $1.18 billion. The decrease in mine production in 2014 compared with that of 2013 was largely owing to the inability to access higher grade ore, partially owing to heavy rains and minor landslides. Lower grade ore was mined from stockpile material before development work was completed to restore full access to the pit. The production at the processing plant decreased owing to a major failure of a semiautogenous grinding (SAG) mill shell and major outages of the primary crusher. Despite the production decrease, the company recorded a net profit of $135 million in 2014 compared with $17 million in 2013 (Ok Tedi Mining Ltd., 2014, p. 26; 2015, p. 26, 81–83).

A total of 381,075 t of copper concentrates was exported in 2014 compared with 394,622 t in 2013. In 2014, the exported concentrates contained 93,760 t of copper, 9,078 kg of gold, and 21,778 kg of silver; in 2013, the exported concentrates contained 100,212 t of copper, 10,950 kg of gold, and 28,907 kg of silver. The concentrate was stored and dispatched from the silo ship MV *Kumul Arrow* to OTML's customers. In 2014, Japan received 54.3% of OTML's total exported concentrates; the Philippines, 15.8%; Germany, 13.6%; the Republic of Korea, 9.1%; India, 5.2%; and Indonesia, 2% (Ok Tedi Mining Ltd., 2015, p. 27, 81).

At yearend 2014, OTML's resources were estimated to be 911 Mt, including measured resources of 332 Mt grading 0.52% copper and 0.58 gram per metric ton (g/t) gold, indicated resources of 485 Mt grading 0.39% copper and 0.47 g/t gold, and inferred resources of 94 Mt grading 0.40% copper and 0.54 g/t gold. At yearend 2013, OTML's resources were estimated to be 871 Mt, including measured resources of 344 Mt grading 0.52% copper and 0.58 g/t gold, indicated resources of 417 Mt grading 0.39% copper and 0.51 g/t gold, and inferred resources of 110 Mt grading 0.41% copper and 0.57 g/t gold. The change from 2013 was largely owing to revised pit optimization modeling and block model changes (Ok Tedi Mining Ltd., 2015, p. 34–35).

OTML's proven and probable ore reserves increased by 33% to 287 Mt in 2014 from 215 Mt in 2013. The 2014 proven reserves were 187 Mt grading 0.55% copper and 0.63 g/t gold, and the probable reserves were 100 Mt grading 0.52% copper and 0.66 g/t gold. The primary cause of the increase in reserves was a revised pit design of the East Wall Cut Back Stage 2, which allowed access to deeper ore that was identified from the 2014 drilling program. This increase also was attributed to changes in mill processing, metal prices, net smelter return assumptions, and minor ore reserve block modeling changes. Depletion from mining in 2014 was 14.5 Mt (Ok Tedi Mining Ltd., 2015, p. 34–35).

The Frieda River copper-gold project is located 70 km south of the Sepik River on the border of the Provinces of Sanduan and East Sepik. The project was composed of four deposits—the Horse-Ivaal-Trukai (HIT), the Koki, and the Ekwai copper-gold porphyry deposits, and the Nena epithermal high-sulfidation copper-gold deposit. At yearend 2014, the mineral resources at the HIT deposit included measured resources of 780 Mt grading 0.51% copper, 0.28% gold, and 0.79 g/t silver; indicated resources of 410 Mt grading 0.44% copper, 0.2% gold, and 0.72 g/t silver; and inferred resources of 920 Mt grading 0.4% copper, 0.2% gold, and 0.7 g/t silver. The total mineral resources of the four deposits were estimated to contain 13 Mt of copper, 622,070 kg of gold, and 1,524 t of silver, positioning the Frieda River project as the largest undeveloped copper-gold project in Papua New Guinea and 1 of the top 10 undeveloped open pit copper mines in the world. The Frieda River project had 3 times the in-ground copper and gold content of all the copper and gold extracted in the past 25 years from the Ok Tedi copper mine, more than 2.5 times the 5.3 Mt of contained copper at the Panguna deposit in Bougainville, and more than the estimated 9 Mt of copper and 600 t of gold contained in Newcrest-Harmony's proposed underground Wafi Golpu project. The life-of-mine mill feed was estimated to be approximately 600 Mt, with an average processing rate of 30 Mt/yr during a 20-year mine life. The average annual production was expected to be 125,000 t of copper and 6,221 kg of gold in concentrate (Highlands Pacific Ltd., 2015, p. 6–7, 12).

In August 2014, PanAust Ltd. (PanAust) of Australia completed the purchase of an 80% interest in the Frieda River project, which was owned by Glencore plc of Switzerland, for an initial consideration of $25 million. Highlands Pacific Ltd. held a 20% interest in the project, and the Papua New Guinea Government had the right to acquire up to a 30% interest. If the Government exercised its right to its full extent, Highlands' holding would be reduced to 15% and PanAust's, to 55% (Highlands Pacific Ltd., 2015, p. 7).

Gold.—Newcrest Mining Ltd. (Newcrest) of Australia operated the Lihir gold mine and the Hidden Valley gold mine. The Lihir operation, which is located on the island of Niolam and is 900 km northeast of Port Moresby in the Province of New Ireland, was 100% owned by Newcrest. Production for the year ended June 2014 was 22,434 kg of gold. At yearend 2014, the Lihir mineral resources were estimated to be 790 Mt grading 2.3 g/t gold and containing 1,835 t of gold, and the Lihir mineral reserves were estimated to be 380 Mt grading 2.4 g/t gold and containing 902 t of gold (Newcrest Mining Ltd., 2015, p. 14–15, 25).

The Hidden Valley operation, which is located approximately 90 km southwest of Lae in the Province of Morobe, was owned by Newcrest (50%) and Harmony Gold Mining Co. Ltd. of South Africa (50%). Hidden Valley consisted of three major deposits—the Hamata, the Hidden Valley, and the Kaveroi deposits. Production for the fiscal year that ended on June 30, 2014, was 6,600 kg of gold compared with 5,500 kg for the fiscal year that ended on June 30, 2013. At yearend 2014, the Hidden Valley mineral resources were estimated to be 83,979 kg of gold and 1,524 t of silver, of which the mineral reserves were estimated to be 46,655 kg of gold and 871 t of silver (Morobe Mining Joint Ventures, 2013; Newcrest Mining Ltd., 2015, p. 17).

The Wafi Golpu gold and copper deposits are located in the Province of Morobe approximately 65 km southwest of the port city of Lae. The Wafi Golpu project consisted of the Golpu and the Nambonga copper-gold porphyry deposits, the Wafi epithermal gold deposit, and other substantial exploration targets. At yearend 2014, the Golpu porphyry deposit had estimated mineral resources of 1,000 Mt containing 622 t of gold and 9 Mt of copper. The reserve estimate was 386 t of gold and 5.4 Mt of copper. The mineral resources for the Wafi epithermal deposit were estimated to be 224 t of gold; the mineral resources for the Nambonga porphyry deposit were estimated to be 31 t of gold and 86,000 t of copper. The Wafi Golpu project was owned by the Wafi Golpu Joint Venture, which was jointly owned by Newcrest (50%) and Harmony Gold (50%).The optimized Golpu prefeasibility study proposed a small, low-capital-cost operation for the first stage of development. The capital cost to build Stage 1 was estimated to be $2.3 billion, with production to begin in 2020 (Morobe Mining Joint Ventures, 2014).

Mineral Fuels

Natural Gas.—The LNG project, which is located in the Hela, Southern Highlands, Western, Gulf, and Central Provinces of Papua New Guinea, was an integrated gas production and processing facility built at a cost of $19 billion. Natural gas was sourced from the Angore, Hides, and Juha fields as well as associated gas from the currently operating oilfields of Agogo, Gobe, Kutubu, and Moran. The natural gas from the fields was first processed at the Hides gas conditioning plant and then supplied to the LNG plant through a 700-km-long pipeline. The project had a capacity of 6.9 Mt/yr of LNG and an expected operational life of 30 years. Condensate (a low-density mixture of hydrocarbon liquids recovered through the gas liquefaction process) was also stored and offloaded at the LNG plant. The LNG plant facilities consisted of two LNG process trains, two 160,000 cubic meters LNG storage tanks, and a loading terminal for LNG tankers with a capacity of up to 220,000 cubic meters (ExxonMobil PNG Ltd., 2015a, b, d).

The project was operated by ExxonMobil PNG Ltd. (EMPNG), which was a subsidiary of Exxon Mobil Corp. of the United States. At yearend 2014, EMPNG held 33.2% interest in the project. Other interest holders included Oil Search Ltd. of Australia, 29%; National Petroleum Co. of Papua New Guinea (Papua New Guinea Government), 16.8%; Santos Ltd. of Australia, 13.5%; JX Nippon Oil and Gas Exploration of Japan, 4.7%; and Mineral Resources Development Co. (Papua New Guinea landowners), 2.8% (Oil Search Ltd., 2015, p. 18).

The Papua New Guinea LNG project started LNG production in April and ramped up to full operational capacity 3 months later. The plant delivered its first cargo of LNG in May. In 2014, EMPNG produced about 4 Mt of LNG and delivered 55 tankers filled with LNG to customers in Asia, including the Chinese Petroleum Corp. of Taiwan, Osaka Gas Co. Ltd. of Japan, Tokyo Electric Power Co. Inc. of Japan, and Unipec Asia Co. (a subsidiary of China Petroleum and Chemical Corp.). These four customers had long-term sales agreements with EMPNG to purchase more than 95% of the project's annual LNG output during the next 20 years (Exxon Mobil Corp., 2015, p. 2, 38; ExxonMobil PNG Ltd., 2015c, p. 1; Oil Search Ltd., 2015, p. 16).

Outlook

According to the Bank of Papua New Guinea, Papua New Guinea's GDP is expected to increase by 15.5% in 2015, driven by a full year of production and the export of LNG and supported by a recovery in the nonmining sectors. Total nonmining GDP is expected to increase by 4.0% in 2015 (compared with 1.4% in 2014) owing to anticipated improvement in the construction sector and increased production of key cash crops (Bank of Papua New Guinea, 2015a. p. 24–25).

Natural gas production is expected to increase owing to the increasing gas exploration and expansion activities aimed at securing a supply of natural gas for processing at the LNG plant. Nickel and cobalt production is expected to increase in the short term as the Ramu Mine ramps up to full production capacity during the next 2 years. Copper and gold production will remain at the same level or decrease slightly owing to the lower grades of ore and unfavorable market conditions. The long-term outlook for the mining sector is positive considering the mineral potential identified at the Wafi Golpu gold and copper deposits and the Frieda River copper and gold deposits.

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TABLE 1

PAPUA NEW GUINEA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2010	2011	2012	2013	2014
Copper, mine output, Cu content	metric tons	159,821	130,473	125,348	105,524 [r]	75,907
Gas, natural, liquefied	million metric tons	--	--	--	--	4
Gas, natural, marketed	million cubic meters	113	113	100	100	160 [e]
Gold, mine output, Au content	kilograms	58,983	62,200	59,100	54,092 [r]	52,858
Nickel cobalt hydroxide:						
Gross weight	metric tons	--	--	13,777	29,763	57,360
Co content	do.	--	--	469	1,013	2,134
Ni content	do.	--	--	5,283	11,369 [r]	20,987
Petroleum, crude	thousand 42-gallon barrels	11,100	11,000	10,000	10,900 [r]	11,000
Silver, mine output, Ag content	kilograms	74,000	90,700	81,300	82,702 [r]	84,302

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. -- Zero.

[1] Table includes data available through October 9, 2015.

[2] In addition to the commodities listed, cement, and construction materials (common clays, sand and gravel, and stone) were produced, but available information was inadequate to make reliable estimates of output.

TABLE 2
PAPUA NEW GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity[e]
Cement	thousand metric tons	Papua New Guinea-Halla Cement Pty. Ltd. (Halla Cement Corp., 50%, and Government, 50%)	Lae, Morobe Province	200
Cobalt	do.	MCC Ramu NiCo, Ltd., 85%; Highlands Pacific Ltd., 8.56%; PNG Government and landowners, 6.44%	Open pit mine facility, Basamuk beneficiation plant, Madang Province	3
Copper	do.	Ok Tedi Mining Ltd. (Government, 100%)	Ok Tedi open cut, Western Province, 20 km northwest of Tabubil and 390 km southwest of Wewak	170
Gold		Newcrest Mining Ltd., 100%	Lihir open cut, Lihir Island, New Ireland Province, 700 km northeast of Port Moresby	26
Do.		St. Barbara Ltd., 100%	Simberi Island open cut, New Ireland Province	3
Do.		Newcrest Mining Ltd., 50%, and Harmony Gold Mining Co. Ltd., 50%	Hidden Valley open cut, Morobe Province, 90 km southwest of Lae	8
Do.		Ok Tedi Mining Ltd. (Government, 100%)	Ok Tedi open cut, Western Province, 20 km northwest of Tabubil and 390 km southwest of Wewak	17
Do.		Porgera Joint Venture [Barrick (Niugini) Ltd., 95%, and Mineral Resources Development Corp., 5%]	Porgera open cut and underground mines, Enga Province, 620 km northwest of Port Moresby	22
Do.		New Guinea Gold Corp., 90%; Niugini Holdings Pty Ltd., 10%	Sinivit open pit, East New Britain Province, about 50 km south southwest of Rabaul	1
Do.		Petromin PNG Holdings (Government, 100%)	Tolukuma Hill open pit, 100 km north of Port Moresby	2
Liquefied natural gas	million metric tons	ExxonMobil PNG Ltd. (Operator), 33.2%; Oil Search Ltd., 29%; National Petroleum Co. of Papua New Guinea (PNG Government); 16.8%; Santos Ltd., 13.5%; JX Nippon Oil and Gas Exploration, 4.7%; Mineral Resources Development Co. (landowners), 2.8%	Southern Highlands, Hela, Western, Gulf, and Central Provinces	7
Natural gas	million cubic meters	Oil Search Ltd., 100%	Hides GTE, Southern Highlands Province, 80 km northwest of Kutubu	160
Nickel	thousand metric tons	MCC Ramu NiCo, Ltd., 85%; Highlands Pacific Ltd., 8.56%; PNG Government and landowners, 6.44%	Open pit mine facility, Basamuk beneficiation plant, Madang Province	32
Petroleum, crude	million 42-gallon barrels	Oil Search Ltd. (operator and manager for license 2), 49.51%; Exxon Mobil Corp. (operator and manager for license 5), 26.82%; Eda Oil Ltd., 11.28%; Merlin Petroleum Co., 8.31%; Petroleum Resources Kutubu Ltd., 2.97%; Petroleum Resources Moran Ltd., 1.10%; Petroleum Resources North West Moran Ltd., 0.02%	Central Moran oilfield, Southern Highlands Province (includes Agogo and Iaqufi-Hedinia fields). Onshore Papuan Basin; petroleum development licenses 2 and 5	2
Do.	thousand 42-gallon barrels	Merlin Petroleum Co., 73.48%; Exxon Mobil Corp., 14.52%; Oil Search Ltd. (operator), 10%; Petroleum Resources (Gobe) Ltd., 2.0%	Gobe Main oilfield, Southern Highlands Province. Onshore Papuan Basin, petroleum development license 4	50
Do.	million 42-gallon barrels	Oil Search Ltd., 60.05% (operator and manager); Merlin Petroleum Co., 18.69%; Exxon Mobil Corp., 14.52%; Petroleum Resources (Kutubu) Ltd., 6.75%	Kutubu oilfield, Southern Highlands Province. Onshore Papuan Basin, petroleum development license 2	4
Do.	thousand 42-gallon barrels	Oil Search Ltd., 36.36%; Southern Highlands Petroleum Ltd., 40.15%; Santos (operator), 15.92%; Cue PNG Oil Co Ltd., 5.57%; Petroleum Resources (Gobe) Ltd., 2.0%	South East Gobe oilfield, Gulf and Southern Highlands Provinces. Onshore Papuan Basin	200
Silver		Porgera Joint Venture [Barrick (Niugini) Ltd., 95%, and Mineral Resources Development Corp., 5%]	Porgera open cut and underground mines, Enga Province, 620 km northwest of Port Moresby	4
Do.		Newcrest Mining Ltd., 50%, and Harmony Gold Mining Co. Ltd., 50%	Hidden Valley open cut, Morobe Province, 90 km southwest of Lae	124
Do.		Ok Tedi Mining Ltd. (Government, 100%)	Ok Tedi open cut, Western Province, 20 km northwest of Tabubil and 390 km southwest of Wewak	30

[e] Estimated. Do., do. Ditto.

[1] Abbreviations used for units of measure in this table include the following: km, kilometer.

THE MINERAL INDUSTRY OF THE PHILIPPINES

By Yolanda Fong-Sam

In 2014, one of the main mineral commodities produced in the Philippines was nickel. The Philippines accounted for about 21% of the world production of nickel, and about 4% of mined cobalt. The country also produced other mineral commodities, such as cement, chromium, copper, gold, marine salt, and silver (table 1; Kuck, 2016; Shedd, 2016).

Minerals in the National Economy

In 2014, the mining and quarrying sector (at constant 2000 prices) contributed about 5% to the Philippines' gross domestic product (GDP) compared with 1% in 2013. The construction sector contributed about 10% to the GDP compared with 5.6% in 2013. The value of metallic mineral production was $3.1 billion[1], compared with $2.3 billion in 2013. The value of nickel produced in 2014 was $1.8 billion (1.1% of GDP); gold, $742.7 million (0.5% of GDP); and copper, $512.7 million (0.3% of GDP) (Bangko Sentral ng Pilipinas, 2015; Mines and Geosciences Bureau, 2015b–c).

Government Policies and Programs

In January 2014, the Department of Environment and Natural Resources (DENR) announced the creation of the Philippine Extractive Industries Transparency Initiative (PH-EITI), which is a policy adopted by the Government to establish and improve accountability and transparency within the country's mining sector, specifically the extractive industry sector. The PH-EITI requires all companies operating in the mining sector to disclose the taxes and fees paid to the Government and the social expenditure programs the companies implement in the communities that it serves. The companies are required to sign a waiver to allow the Bureau of Internal Revenue to disclose the dues paid to the Government. In turn, the Government has to disclose what it has received from companies in an annual country report. As of October 2014, not all companies involved in the extractive industry sector have agreed to fully disclose their dues. In 2013, the DENR was designated as the agency in charge of implementing the Extractive Industries Transparency Initiative (EITI) in the country. The EITI is an international effort designed to set the standards for transparency in the management of revenue derived from extractive industries, such as mining and oil and natural gas extraction. The initiative is voluntary and requires participating countries to publish the receipts from their extractive mining activities. On May 22, 2013, the EITI International Board admitted the Philippines as a candidate country for its commitment to implement the transparency initiative (Agub, 2013, p. 9; Jamasmie, 2014; Mayer Brown Consulting, 2014, p. 3).

On January 27, the Senate Bill 2086 (SB 2086) was introduced to the Senate Office of the Secretary, which would mandate a competitive public bidding process for the granting of all mining rights and mining tenements over areas with known and verified mineral resources and reserves, including those owned by the Government and all expired tenements. For the bidding process, the Mines and Geosciences Bureau (MGB) is in charge of preparing a competitive bid package and formulating the guidelines and procedures to conduct such activities (Binay, 2014).

By mid-2014, two bills were filed in the Philippines Congress proposing that exporting of unprocessed mineral ores be halted. The proposed measures were House Bill 4728 (HB 4728) and Senate Bill 4728 (SB 4728), which both sought to revise several provisions in the Philippine Mining Act of 1995, also known as the Republic Act 7942 (RA 7942). The purpose of the provisions is to define mineral processing as the process of separating commercially valuable minerals from their mineral ores, to redefine the ore transport permit to include destinations within the Philippines, and to clearly specify that extracted mineral ores should be processed within the Philippines or otherwise be subjected to sanctions and penalties for violations. The Secretary of the DENR suggested adding a provision to the draft bills that supports the creation and establishment of processing plants. Some of the objectives of the proposed bills are to attract foreign investments, to increase the generation of domestic income, and to create more domestic jobs. No timeframe was proposed to ban the mineral ore exports (Aquino, 2014; Mayer Brown Consulting, 2014, p. 2–3; Valencia, 2014).

Since Executive Order 79 was implemented in 2012, the Government and the extractive mining industry have been in talks to establish a new revenue-sharing scheme. Executive Order 79 created the Mining Industry Coordinating Council (MICC) as an interagency body in charge of conducting dialogue with stakeholders, reviewing all existing mining-related laws and regulations, conducting public auctions for mining tenements, ensuring that contractors have the proper environmental insurance coverage and perpetual liability, implementing other industry reforms, and supervising the drafting of a new mining law. In 2014, the MICC proposed the imposition of either a 10% tax on gross revenues or a 55% tax on adjusted mining revenues (defined as the difference between gross sales and direct costs, which included mining costs and administrative expenses), in addition to a percentage of windfall profit, whichever is higher. The proposed revenue-sharing scheme would apply to metallic mining projects holding a Financial or Technical Assistance Agreement (FTAA) and a mineral production-sharing agreement (MPSA). As of December, the scheme was still awaiting a decision from the Office of the President (Valencia, 2014).

When Executive Order 79 was approved, it immediately imposed a moratorium on the approval of new mining projects until Congress passes a legislative measure to increase royalty fees. After the Order came into effect, the mining industry was at a standstill as new mining contracts were put on hold. In early 2013, the MGB resumed accepting applications for FTAA exploration permits. The lifting of the ban did not apply to MPSA (Agub, 2013).

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[1] Where necessary, values have been converted from Philippine pesos (PHP) to U.S. dollars (US$) at an average rate of PHP44.40=US$1.00 for 2014 and PHP42.45=US$1.00 for 2013.

In October, the MGB imposed a moratorium on the issuance of mineral ore export permits for magnetite (black sand) operations on the grounds that the MICC has a pending order to review the safety and legality of existing magnetite operations. Magnetite is mainly used as a component in the production of steel, and it is mainly exported to China (Valencia, 2014).

Production

Based on import trade data, in 2014, the Philippines produced 523,000 metric tons (t) of nickel, which was an increase of 12.7% compared with that of 2013. The increase could be attributed to the full year of operation of Taganito Mining Corp.'s (a subsidiary of Nickel Asia Corp.) high-pressure acid-leach (HPAL) plant. Other mineral commodities for which production increased significantly compared with that of 2013 included manganese (130.8%), cobalt (92.6%), chromite (33.4%), perlite (20.7%), lime (17.7%), and coal (15.6%). Zinc production was reported as zero in 2014, owing to the closure of the two plants operating in country (details in the commodity review section). Other commodities for which production decreased in 2014 included silver (42.5%), iron ore (21.8%), and smelted and refined copper (15.8% and 15%, respectively), which could be attributed to the closure of the milling operations at the Canatuan Mine) (table 1; Nickel Asia Corp., 2014; TVI Pacific Inc., 2014a, p. 10; 2014b).

Structure of the Mineral Industry

In 2014, an estimated 235,000 people, or 0.6% of the total number of people employed in the country, worked in the mining and quarrying industry. As of February, and according to the MGB, the Philippines had a total of 755 approved mining tenements, which were distributed as 339 MPSA, 228 industrial sand and gravel permits, 123 mineral processing permits, 55 exploration permits, 6 FTAA, and 4 mining lease contracts. In addition, as of October, the country had a total of five processing plants (two for gold, two for nickel, and one for copper), 45 operating metallic mines, and 55 operating nonmetallic mines (Billedo, 2014; Mayer Brown Consulting, 2014, p. 2; Mines and Geosciences Bureau, 2015a).

Some of the main producers of mineral commodities in the Philippines were Benguet Corp. of the Philippines (chromite); Lepanto Consolidated Mining Co. of the Philippines (gold and silver); Philex Mining Corp. of Canada (copper, gold, and silver); Taganito Mining Corp. (nickel); and TVI Resources Development Philippines Inc. (TVIRD), which was the Philippines affiliate of TVI Pacific Inc. of Canada (gold and silver). The country's major mineral industry facilities are listed in table 2.

Mineral Trade

In 2014, total trade between the Philippines and the world increased by 7% to $127.5 billion from $119.1 billion in 2013. The country's total exports were valued at $62.1 billion compared with $56.7 billion in 2013, which was an increase of 9.5%; also, the total value of imports in 2014 increased by 4.8% to $65.4 billion from $62.4 billion in 2013. According to the MGB, in 2014, mineral exports of selected metals from the Philippines amounted to $4.01 billion compared with $2.67 billion in 2013, and included copper, gold, and nickel. These increases are likely attributable to changes in global metal prices and increases in the production of these commodities. Main destinations included Australia, Canada, China, and Japan. Imports of iron and steel and mineral fuels and related materials were valued at nearly $15 billion (which was about 23% of the country's total import value) compared with $14.6 billion in 2013 (Mines and Geosciences Bureau, 2015c; National Statistics Office of the Philippines, 2015).

In 2014, the Philippines' leading trading partner was Japan, which accounted for 15% ($19.2 billion) of the country's total trade, including $13.9 billion in exports to Japan and $5.3 billion in imports from Japan. The second-ranked trading partner was China, which accounted for 14.3% ($18.4 billion) of total trade; exports to and imports from China were valued at $8.5 billion and $9.9 billion, respectively. The third-ranked trading partner was the United States, which accounted for 11.2% ($14.4 billion) of total trade; exports to and imports from the United States were valued at $8.7 billion and $5.7 billion, respectively. The country's fourth- and fifth-ranked trading partners were Singapore and the Republic of Korea, which accounted for 7.1% and 6%, respectively, of the Philippines' total trade. Exports to Singapore were valued at $4.5 billion, and imports from Singapore were valued at $4.6 billion. Exports to the Republic of Korea were valued at $2.6 billion, and imports from the Republic of Korea were valued at $5.1 billion. Total trade with the countries of the European Union accounted for $14.3 billion, which was equivalent to 11.2% of the country's total trade (National Statistics Office of the Philippines, 2015).

Commodity Review

Metals

Copper, Gold, Silver, and Zinc.—In 2014, mined copper production in the country totaled 91,922 t of copper content, which was an increase of 1.2% compared with the 90,861 t produced in 2013. Although the increase was modest, the sector's performance was relatively strong given the closure of Rapu-Rapu Processing Inc.'s polymetallic project and the announced closure of the Canatuan mining project (which produced only from stockpile in 2014). Mined gold production increased by 6.8% in 2014 to 18,423 kilograms (kg) from 17,248 kg in 2013. In 2014, the Didipio project (OceanaGold Corp. of Australia, 92% interest) increased its production of copper by 19% to 25,010 t from 20,986 t in 2013, and gold, by 59.7% to 3,305 kg from 2,069 kg in 2013. The Didipio project, which started production in April 2013, is located in the north of Luzon Island in northern Philippines, approximately

270 kilometers (km) north of the capital city of Manila. OceanaGold estimated a mine life of 15 years. OceanaGold expected to mine the Didipio deposit as an open pit until 2017, to start underground development in late 2017, and to concurrently run the open pit and underground activities until depletion. A full mining rate of 1.6 million metric tons per year (Mt/yr) of ore was expected by 2020 (table 1; TVI Pacific Inc., 2014a, p. 10; 2014b; Mines and Geosciences Bureau, 2015b; OceanaGold Corp., 2015, p. 7, 17).

In March, St. Augustine Gold and Copper Ltd. of Hong Kong and its joint-venture partner, Nationwide Development Corp., announced the approval of the environmental impact statement for its King-King copper and gold project and received the environmental compliance certificate from the Philippines Environmental Management Bureau. Based on preliminary studies, the project was expected to recover about 1.4 million metric tons (Mt) of copper and about 168,000 kg (reported as 5.4 million troy ounces) of gold during the mine's expected 25-year life. The mineral reserve was determined to be about 618 Mt at grades of 0.3% copper and 0.395 gram per metric ton (g/t) gold. The King-King project is located 35 km northeast of Davao City in the southeastern part of Mindanao Island. The company expected the project to start construction in 2016, and to begin heap leach production in 2018 and mill production in 2019 (St. Augustine Gold & Copper Ltd., 2015a, b).

Carmen Copper Corp., which was a wholly owned subsidiary of Atlas Consolidated Mining and Development Corp. (Atlas Mining) of the Philippines, had operating rights for the Toledo copper mine, which included the mineral resources of the Biga, the Carmen, and the Lutopan mineral deposits. The Toledo copper mine consisted of an area covering 1,674 hectares. In March, Carmen Copper commissioned the expansion of its processing plant and posted a 20% increase in the total amount milled. Carmen Copper planned to install the required technology to boost its production of byproduct molybdenum in concentrate by installing a collector in the copper flotation process. The installation was scheduled for mid-2015 with an expected production startup in the fall of 2015. To ensure enough long-term power supply to cover the new expansion requirements, Carmen Copper reached an agreement with Toledo Power Co. for an additional 15 megawatts (MW) of electric generating capacity, which the latter incorporated by completing the construction of an 82-MW-capacity coal-fired powerplant in December 2014. Also in 2014, the company implemented improvements to the nearby port facilities as it forecasted an increase in shipping volumes. The improvements included an extension in the conveyor house, installation of a fire hydrant system, and construction of a 1,560-square-meter concrete pad for drying copper concentrates (Atlas Consolidated Mining and Development Corp., 2015).

Production of silver decreased by 42.5% to 23,005 kg in 2014 from 40,043 kg in 2013 owing mainly to the closure of the Rapu-Rapu polymetallic project. In June, Phylex Mining Corp. announced its plans to consider developing the Silangan project as an open pit in order to reduce costs. The current estimated cost for the project was $1.5 billion and would involve underground mining. By changing the mining method, the company was expected to save about two-thirds of the cost. The project is located in Surigao del Norte on the northern part of Mindanao Island, and would combine the development of the Bayugo and the Boyongan deposits, which include copper, gold, and silver. In 2014, operational problems prompted the company to delay startup of production until 2018. The estimated reserves for the project were about 4.1 Mt of copper and about 280,000 kg (reported as 9 million troy ounces) of gold during the mine's projected 25-year life (table 1; Thomson Reuters, 2014; TVI Pacific Inc., 2014a, p. 10; 2014b).

Zinc production was zero in 2014 owing to the closure of the two projects operating in the country—the Canatuan mining project and the Rapu-Rapu polymetallic project. In January, TVIRD announced that it had ceased milling operations at the Canatuan copper and zinc mine. TVIRD was actively assessing the opportunities to extend and expand the life of the mine as a result of the depletion of stockpiled material at the mine. During 2014, the company was expecting new discoveries as a result of exploration drilling near the outskirts of the Canatuan facility. By September, TVIRD was still awaiting approval from the Government to retrieve two shipments from its Rapu-Rapu Mine and polymetallic processing project, which are located in Albay Province in central-eastern Philippines and closed at the end of 2013 (table 1; TVI Pacific Inc., 2014a, p. 10; 2014b).

In March, Red Mountain Mining Ltd. of Australia announced the completion of the scoping study for the Batangas gold project, which is located on Luzon Island in the northern Philippines. The study confirmed the potential to develop a gold mining and processing project using an open pit mining method and a carbon-in-leach process to produce the high-grade gold resources. In April, the company finalized the submission of the permit application for the development, mining, and processing of gold at the project. In June, the company announced an upgrade to the indicated and inferred resources of the Batanga project, which included the Archangel prospect and the Lobo prospect, to 6.19 Mt at a grade of 2.2 g/t gold, for a total of about 13,800 kg (reported as 444,000 troy ounces) of gold (Red Mountain Mining Ltd., 2014).

Nickel.—In 2014, based on information compiled using trade data, the production of nickel in the Philippines increased to 523,000 t compared with 464,000 t (revised) in 2013 (table 1). During 2014, the nickel sector faced some uncertainty regarding the export of nickel ores by the proposed measures, HB 4728 and SB 4728, to ban the export of unprocessed mineral ores. In early 2014, a similar bill introduced in Indonesia banned all exports of unprocessed minerals, such as bauxite, and nickel and tin ores. After the implementation of the ban in Indonesia, the Philippines was considered the main supplier of nickel ore to the nickel pig iron industry in China. Taking into consideration the various outcomes if the proposed bills were approved by the Philippines, the nickel sector raised concerns that the mining industry in the country might not be large enough to attract investments to build smelting plants or to develop a strong downstream processing operation that would produce a variety of finished products. Nickel prices would be affected, and business with trading partners could be jeopardized. By banning the export of nickel ores, the Government sought to increase the contribution of the mining sector to the country's economy by attracting investors to develop the mining processing sector. The Government did not offer a timeframe for imposing the ban (Aquino, 2014; Mayer Brown Consulting, 2014, p. 2–3; Ritzema, 2014; Valencia, 2014).

Industrial Minerals

Cement.—In 2014, the production of cement in the Philippines was estimated to have increased by about 9% to 22 Mt from 20.1 Mt in 2013 (table 1). The increase in production was driven mainly by the continuous growth in the construction sector following the destruction caused by Typhoon Haiyan, which struck the islands in November 2013. In 2014, the Government increased the reconstruction budget for infrastructure to $9 billion from $6.6 billion in 2013 (table 1; Global Cement, 2015)

In February, Holcim Philippines Inc. announced the delay of its plans to build a 2.5-Mt/yr cement plant to be located at Norzagaray, Balucan, near Quezon City on Luzon Island. The proposed project was projected to cost $550 million and was originally planned for startup in 2016. In March, Lafarge Republic, Inc. announced plans to invest $25 million in the construction of a new 850,000-metric-ton-per-year-capacity cement mill at its plant in Bulacan. The company expected the project to be fully operational by mid-2015. In November, Pacific Cement Co. (PACEMCO) announced that it was extending the suspension of operations at its cement plant for another 3 months pending negotiations regarding the financing needed to reopen the plant, which had been closed since May (Global Cement, 2015).

Outlook

By the end of 2014, the proposed revenue- and production-sharing scheme proposed by the MICC was still awaiting a decision from the Office of the President. Meanwhile, investors were cautious about the higher taxes proposed by the scheme. The metals sector also faced uncertainly owing to the several bills that had been proposed banning the export of unprocessed mineral ores and encouraging investors to set up more domestic processing facilities in order to increase revenues by increasing foreign investment opportunities and lowering transportation costs. The export ban on ores from the Philippines could potentially influence metal prices in the Southeast Asia region as demand increases but the availability of ores for import decreases. The ban could also jeopardize trading among partners.

In the next several years, the Philippines expects several mining investment projects that progressed in 2014 to be commissioned, including Lafarge's construction of a new cement mill (to be commissioned in 2015), Carmen Copper's molybdenum production project (to be commissioned in 2015), and the King-King copper and gold project (to start construction in 2016). The Government is expected to increase its construction budget as the country rebuilds its infrastructure, and cement production is expected to increase to meet demand.

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TABLE 1
PHILIPPINES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
METALS						
Chromium, chromite, gross weight		14,807	25,483	36,628	35,281[r]	47,056
Cobalt, mine output, Co content[3]		2,100[e]	2,000[e]	2,269[r]	2,126[r]	4,094
Copper:						
Mine output, Cu content		58,412	63,835	65,444	90,861	91,922
Metal:						
Smelter		216,200	205,000	97,000	181,900	153,200
Refined		171,900	164,100[r]	90,400	153,000[r]	130,000
Gold, mine output, Au content	kilograms	40,847	31,120	14,596	17,248	18,423
Iron and steel:						
Iron ore, gross weight		--	468,000	1,800,000	1,056,694[r]	826,745
Iron ore, Fe content (62.5%)		--	292,608	1,148,232	793,130	516,716
Steel, crude	thousand metric tons	1,050	1,200	1,260[r]	1,308	1,196
Lead, metal, secondary refined		30,000	34,000	32,000	32,000[e]	30,000
Manganese:						
Gross weight		11,300	4,300	500	3,100	6,900
Mn content (43%)		4,900	1,900	200	1,300	3,000
Nickel, mine output, Ni content[4, 5]		150,000	202,000	322,000	464,000[r]	523,000
Silver, mine output, Ag content	kilograms	41,004	45,530	49,211	40,043	23,005
Zinc, mine output, Zn content		9,268	18,170	19,559	16,730	--
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	15,900	16,063	18,907	20,150	22,000[e]
Clays:						
Bentonite		1,475	2,087	2,699	3,329	3,369
Kaolin		NA	NA	NA	6,568	7,050
Red		7,050	8,243	9,405	9,551	10,512
White		8,857	12,246	13,623	17,532	18,769
Other		5,878	8,143	10,338	13,560	15,655
Feldspar		15,882	22,050	24,969	30,388	34,232
Lime		4,524	5,934	6,631	6,690	7,877
Perlite		4,756	6,272	9,221	14,249	17,194
Phosphate rock:						
Gross weight		2,308	2,778	2,952	3,478	3,897
P_2O_5 content		779	945	1,004	1,183	1,325
Salt, marine		557,644	720,146	774,815	992,640	1,016,263
Sand and gravel:						
Silica sand	thousand metric tons	296	352	260	429	467
Other[6]	thousand cubic meters	49,009	58,815	66,664	90,300	100,908

See footnotes at end of table.

TABLE 1—Continued
PHILIPPINES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
INDUSTRIAL MINERALS—Continued						
Stone:						
Crushed, broken, other[7]	thousand cubic meters	3,258	4,259	5,502	6,873	7,480
Dolomite		1,259,152	1,431,118	1,627,028	2,611,853	2,948,034
Limestone[8]	thousand metric tons	35,540	42,526	53,708	73,359	77,665
Marble, dimension, unfinished	cubic meters	6,001	8,043	11,311	20,154	23,661
Pumice		2,274	2,797	2,895	5,566	6,018
Tuff		19,166	22,106	22,295	26,930	28,884
Volcanic cinder[9]	cubic meters	7,325	9,219	9,408	11,292	11,620
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand metric tons	6,650	6,881	9,600	10,732	12,406
Gas, natural, gross	million cubic meters	3,681	3,975	4,000 [e]	4,000 [e]	4,000
Petroleum, crude	thousand 42-gallon barrels	3,059	2,326	2,500 [e]	2,500 [e]	2,500

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through October 1, 2015.

[2] In addition to the commodities listed, the Philippines produced platinum-group metals as byproducts of other metal production, quartz, sulfur, and such refinery products as liquefied petroleum gas, gasoline, jet fuel, kerosene, distillate fuel oil, residual fuel oil, and refinery fuel, but available information was inadequate to make reliable estimates of output.

[3] The majority of the nickel laterite produced in the Philippines was exported to China, but whether cobalt content was recovered is not known.

[4] Nickel mine output Ni content production, in metric tons, reported by the Government, was 2010—184,330; 2011—319,363; 2012—317,621; 2013—315,633; and 2014—410,789. The numbers in the table have been adjusted to take into account data received from individual company sources as well as trade statistics (see footnote 5).

[5] Data compiled using trade data from the United Nations Comtrade database (http://comtrade.un.org) for nickel ores and concentrates (code 2604) exported from the Philippines to Australia, China, Hong Kong, and Japan.

[6] Includes "pebbles" and "soil" not further described.

[7] Includes materials described as rock, crushed or broken and blasted; stones, cobbles, and boulders; pebbles; rock aggregates; and broken adobe.

[8] Includes limestone for agriculture, cement manufacturing, industrial use, and other.

[9] Reported as "black cinder" for years 2010–11 by the Philippines Mines and Geosciences Bureau.

TABLE 2
PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Eagle Cement Co.	Plant located in Akle, San Ildefonso, Bulacan Province	1,500,000.
Do.		Fortune Cement Corp.	Bulacan plant at Norzagaray, Bulacan Province; Batangas plant at Taysan, Batangas Province	2,100,000.
Do.		Holcim Philippines, Inc.	Bulacan plant at Norzagaray, Bulacan Province; Davao plant at Barrio Ilang, Davao City; La Union plant at Bacnotan, La Union Province; Lugait plant at Lugait, Misamis Oriental Province	7,630,000.
Do.		Lafarge Republic Inc.	Batangas plant at Taysan, Batangas Province; Bulacan plant at Norzagaray, Bulacan Province; Iligan Plant at Ilagan City, Isabela Province; Norzagaray Plant at Norzafaray, Bulacan Province; Teresa plant at Teresa, Rizal Province	6,060,000.
Do.		Solid Cement Corp., APO Cement Corp., and Rizal Cement Corp. (CEMEX Philippines)	Cement plants at three locations— Naga, Cebu Province (APO Cement Corp.); Antipolo City, Rizal Province (Solid Cement Corp.); Binangonan, Rizal Province (Rizal Cement Corp.)	4,830,000.
Chromite, Cr content		Consolidated Mines Inc. (owner) and Benguet Corp. (operator)	Masinloc chromite mine (Coto chromite deposit) located in Coto 27 kilometers east of the Port of Masinloc in Zambales Province	5,000.
Do.		Heritage Resources Mining Corp.	Homonhon chromite project	17,000.
Do.		Krominco Inc.	Dinagat chromite project—Redondo Mine (Mt. Redondo deposit) located in the Loreto Municipality, Dinagat Island	26,000.
Copper, Cu content		Carmen Copper Corp. (wholly owned by Atlas Consolidated Mining and Development Corp.)	Toledo Copper Complex (Carmen and Lutopan mining) area located in the Central Highlands of Cebu Island	20,000.
Do.		Oceana Gold Philippines Inc.	Didipio Copper Gold Project located on the north of Luzon Island in northern Philippines	25,010.
Do.		Philex Mining Corp. (through its subsidiary Philex Gold Inc.), 81%	Padcal copper project located in Tuba, Benguet Province, Luzon Island	21,000.
Do.		TVI Resources Development Philippine Inc., 100%	Canatuan project, located east of Siocon, Zamboanga del Norte Province, Mindanao Island	10,000.
Copper, metal		Glencore International plc.	Philippine Associated Smelting and Refining Corp. (PASAR), located at Isabel, Leyte Province	250,000 smelter; 173,000 refinery.
Gold, Au content	kilograms	APEX Mining Company Inc.	APEX Maco operation	100.
Do.	do.	CGA Mining Ltd.	Masbate gold project, located 350 kilometers south of Manila, Masbate Island	6,000.
Do.	do.	Lepanto Consolidated Mining Co.	Victoria and Teresa Mines located in Mankayan, Benguet Province	2,000.
Do.	do.	OceanaGold Philippines Inc.	Didipio Copper Gold Project located on the north of Luzon Island in northern Philippines	3,305.
Do.	do.	Philex Mining Corp. (through its subsidiary Philex Gold Inc.), 81%	Padcal Mine (Sto. Tomas II deposit) located at Tuba, Benguet Province, Luzon Island	5,000.
Do.	do.	Philippine Mining Development Corp.	Diwalwal Direct State Development Project at Mount Diwalwal in Davao del Norte Province	100.
Do.	do.	Philsaga Mining Corp.	Banahaw gold project	NA.
Do.	do.	TVI Resources Development Philippine Inc., 100%	Canatuan project, located east of Siocon, Zamboanga del Norte Province, Mindanao Island	500.[1]
Gold, refinery	do.	Bangko Sentral ng Pilipinas	Mint and Refinery Operations Department, located at Quezon City	NA.

See footnotes at end of table.

TABLE 2—Continued
PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Nickel, Ni content		CRAU Mineral Resources Corp.	Santa Cruz-Candelaria nickel project, located in Zambales Province	1,000.
Do.		CTP Construction & Mining Corp.	Adlay-Cagdianao-Tandawa (ACT) nickel project, located at Barangay Adlay, Carrascal municipality, Surigao del Sur Province	10,000.
Do.		Hinatuan Mining Corp.	South Dinagat project, located on Nonoc Island	4,000.
Do.		do.	Tagana-an nickel project, located on Hinatuan Island	30,000.
Do.		Nickel Asia Corp., 100%	Cagdianao nickel project located near Barangay Valencia on Dinagat Island	10,000.
Do.		Taganito Mining Corp. (Nickel Asia Corp., 65%; Pacific Metals Co. Ltd., 33.5%; Sojitz Philippines, 1.5%)	Claver nickel project (Taganito) located in Surigao del Norte Province, Mindanao Island	70,000 nickel; 2,600 cobalt.
Do.		Nickel Asia Corp., 60%; Pacific Metals Co. Ltd., 36%; Sojitz Philippines, 4%	Rio Tuba nickel project, located at Barrio Rio Tuba, Bataraza Municipality in Palawan Province	5,000.
Do.		SR Metals, Inc.	SR nickel project, Tubay Mine, located at Tubay, Agusan del Norte Province	25,000.
Do.		Toledo Mining Corp. Plc., 56.1%	Berong nickel project, located on Palawan Island	10,000.
Nickel, plant		Coral Bay Nickel Corp. (Sumitomo Metal Mining Co. Ltd., 54%; Mitsui & Co. Ltd. 18%; Rio Tuba Nickel Mining Corp., 10%; Nickel Asia Corp., 6%)	Coral Bay nickel high-pressure acid-leach (HPAL) plant, located on Palawan Island	24,000 nickel; 1,800 cobalt.
Petroleum, refinery	thousand 42-gallon barrels	Petron Corp.	Limay, Bataan	3,650.
Silver, Ag content	kilograms	Lepanto Consolidated Mining Co.	Victoria and Teresa Mines, located at Mankayan, Benguet Province	4,000.
Do.	do.	Philex Mining Corp. (through its subsidiary Philex Gold Inc.), 81%	Padcal Mine (Santo Tomas II deposit), located at Tuba, Benguet Province, Luzon Island	5,000.
Do.	do.	TVI Resources Development Philippine Inc., 100%	Canatuan project, located east of Siocon, Zamboanga del Norte Province, Mindanao Island	17,000.

Do., do. Ditto. NA Not available.

[1] Producing from stockpile in 2014.

THE MINERAL INDUSTRY OF THE SOLOMON ISLANDS

By Karine M. Renaud

The Solomon Islands is a country in the South Pacific Ocean that consists of large and small volcanic islands and hundreds of islets and atolls. About 80% of the country's population depends on agriculture, fishing, and forestry for at least a portion of its livelihood. The mineral resources that are the most significant to the economy are gold and silver. The country's undeveloped mineral resources include lateritic bauxite, lead, nickel, and zinc (Asian Development Bank, 2015b).

Minerals in the National Economy

In April 2014, severe flooding in the Solomon Islands caused damage to businesses, residential properties, and public infrastructure, such as bridges and crossings on the West Guadalcanal Highway that led to the capital city of Honiara. The most affected areas were Honiara, West Guadalcanal Province, and Isabel Province. In addition, the flooding led to the closure of the Gold Ridge Mine, the only gold and silver mine in the country. In 2014, the country's gross domestic product (GDP) increased by 2% compared with a 2.8% (revised) increase in 2013. Economic growth was driven mainly by the agriculture and fishing industries (Kitco News, 2013; Central Bank of Solomon Islands, 2014b, p. 4; Reliefweb, 2014; Asian Development Bank, 2015a, p. 258).

Solomon Island's exports totaled $411 million (SBD3.12 billion) in 2014 compared with $403 million (SBD2.95 billion) (revised) in 2013, and imports totaled $456 million (SBD3.47 billion) in 2014 compared with $476 million (SBD3.49 billion) (revised) in 2013. The value of mineral exports decreased by 67% to $28 million (SBD210 million) from $85 million (SBD624 million) owing to the closure of the Gold Ridge Mine and accounted for 7% of total exports in 2014 compared with 21% (revised) in 2013. Gold and silver exports went mostly to Australia. The value of mineral fuel imports decreased by 14% owing to the closure of the Gold Ridge Mine, which was the leading fuel consumer in the Solomon Islands, and accounted for 22% of total fuel imports in 2014 compared with 26% in 2013. Solomon Islands' major export partners, by value, in 2014 were China (57.5%), Australia (10.6%), the United Kingdom (6.3%), and Italy (5.9%). The major import partners, by value, were Australia (27.6%), Singapore (24.2%), China (12.0%), and Malaysia (8.4%) (Central Bank of Solomon Islands, 2013; 2014a; 2014b, p. 4, 53–54; Australia Department of Foreign Affairs and Trade, 2014).

Government Policies and Programs

In July, the National Parliament of the Solomon Islands passed the Mines and Minerals (Amendment) Act 2014 (formerly the Mines and Minerals Act 1996). The Mines and Minerals (Amendment) Act 2014 states that all mining companies that hold mining licenses in the Solomon Islands are expected to invest in improvements of infrastructure in the Solomon Islands. The newly established Mining Royalty Special Fund's responsibilities include collecting royalty payments on minerals other than bauxite, copper, gold, iron ore, nickel, and silver, such as lead, phosphate, and zinc. The consolidated revenues of the Government of the Solomon Islands would include the royalty payments for bauxite, copper, gold, iron ore, nickel, and silver, of which 10% would be paid to the Government of the Solomon Islands as a trustee of the Government for the Province in which the licensed area is located and 40% would be paid to the Government of the Solomon Islands as a trustee for the land owner of the licensed area (National Parliament of Solomon Islands, 2014, p. 4–6).

Production

In 2014, gold output decreased by 26% compared with that of 2013, and silver output decreased by 32% compared with that of 2013. The decrease in output resulted from the low global price of gold in 2014 ($1,300 per troy ounce) and flooding that led to the closure of the Gold Ridge Mine (table 1).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Commodity Review

Metals

Alumina and Bauxite.—Solomon Bauxite Ltd. (a subsidiary of Southwest Pacific Bauxite Pty Ltd. of Australia) held 75% interest in the Vaghena Island bauxite project. The project contained about 25 million metric tons (Mt) of bauxite. A feasibility study for the project was planned to be completed in mid-2014. As of year's end 2014, there was no updated information about the feasibility study. Depending on the results of the study and the granting of mining licenses, production could begin in 2015. The projected production capacity of the mine was 1.2 million metric tons per year (Mt/yr) of bauxite, which could be expanded to 2 Mt/yr after several years. The project is located on the northeastern portion of Vaghena Island, and it was expected to employ between 200 and 250 people (Solomon Bauxite Ltd., 2014; Southwest Pacific Bauxite Pty Ltd., 2014).

In December 2014, the Ministry of Mines, Energy and Rural Electrification canceled PT Mega Bingtang Borneo Ltd. of Indonesia's mining licenses and ordered it to stop operations at the bauxite area on Rennell Island in Renbel Province. The Ministry of Mines, Energy and Rural Electrification awarded PT Mega Bingtang Borneo Ltd.'s licensed area to Asia Pacific Investment and Development Ltd. (APID) of Indonesia because PT Mega Bingtang Borneo Ltd.'s licensed area fell under APID's prospecting licenses, which were renewed in 2012. In 1968, Mitsui conducted a survey of the southern part of

Rennell Island and estimated total bauxite reserves to be more than 36 Mt. In October 2014, APID held a groundbreaking ceremony in the western part of Rennell Island. The company moved some equipment and was expected to move 80 more motorized machines for operations to the development area; it was also expected to employ 200 local workers. The mined bauxite would be exported and processed abroad (Stock, 1970, p. 972; Puia, 2014a, b; Theonomi, 2014a, b).

Copper, Gold, and Silver.—Gold Ridge Mine, which is located in Guadalcanal Province, was the only operating gold and silver mine in Solomon Islands. As of June 2014, total probable reserves at the mine were estimated to be 14.6 Mt at a grade of 1.4 grams per metric ton (g/t) gold. From January through March and June through July, Gold Ridge Mine produced 1,403 kilograms (kg) of gold and 280 kg of silver. From April to June, operations at the Gold Ridge Mine were stopped owing to escalating security concerns, damages caused by severe flooding of the only access road to the mine, lack of food supply and fuel for electricity, and flooded open pit mines. St Barbara Ltd. evacuated 200 employees from the mining site. Later in the year, St Barbara Ltd. cut more than 400 jobs at the mine and negotiated transferring the operation of the Gold Ridge Mine to the Government of Solomon Islands. The Government of Solomon Islands and the landowners of the Gold Ridge Mine expressed concern about the collapse of a tailings dam, which could cause contamination of water in the Metapona River (Central Bank of Solomon Islands, 2014b, p. 12, 67; Radio New Zealand, 2014; Solomon Times Online, 2014b–e; St Barbara Ltd., 2014, p. ii–iii, 7; Swanepoel, 2014).

The exploration licenses for the Kuma copper-gold project and the Fauro Island project were awarded in 2013 to Australian Resource Management Pty Ltd. of Australia, a wholly owned subsidiary of SolGold plc of Australia (formerly Solomon Gold plc). In 2014, SolGold conducted exploration studies for copper and gold at the Kuma project; the Fauro Island project, the Lower Koloula project, and the Malukuna project were not included in the exploration studies. The Kuma project is a copper-gold porphyry system located about 40 kilometers (km) south-southeast of the capital, Honiara. The area of the Kuma project is 43 square kilometers (km^2). In September, SolGold collected 184 soil samples for analysis, 184 samples for spectral analysis, and 3 rock-chip samples for analysis at the Kuma project (Asia Miner News, 2013; SolGold plc, 2013a, p. 24; 2014, p. 8, 37, 41).

The Fauro Island project consists of nine target areas and includes the central Ballyorlo porphyry copper and gold deposit and peripheral high-level targets and high-grade epithermal gold-silver targets at Kiovakase and Meriguna. The exploration licenses for the Malukuna and Lower Koloula projects were awarded to Guadalcanal Exploration Pty Ltd., a 100%-owned subsidiary of SolGold, in 2013. The Malukuna project is located 23 km southeast of Honiara and covers an area of 36 km^2 that has not yet been explored. The Lower Koloula project consists of two main areas of interest—the Big Frog and the Pepechichi areas. Big Frog is a porphyry system, and rock-float samples graded 2.47 g/t gold, 100 g/t silver, and more than 0.1% copper. The Pepechichi area is defined by a copper-gold anomaly (Asia Miner News, 2013; SolGold plc, 2013a, p. 23–24, 26; 2013b, p. 1–5)

In 2014, Axiom Mining Ltd. of Australia was granted an exploration license for the West Guadalcanal project. The project is an epithermal gold and copper-gold system that covers an area of 485 km^2. The West Guadalcanal project consisted of three prospects—Mt. Tanijili, Taho, and Polo. In 2014, Axiom Mining planned to carry out initial drilling to a depth of 2,500 meters (m) at the Taho prospect. A total of 1,529 m was drilled with nine holes. The drilling results included 4.35 m containing 0.91 g/t gold and 7.22 g/t silver. Trenching results indicated that the surface mineralization zone could be extended to 1.5 km (Axiom Mining Ltd., 2014a, p. 12–15; Axiom Mining Ltd., 2015a, b).

Global Immune Technologies of the United States has signed a security exchange agreement with U.S.-based Universal Resources (formerly Meekom Transaction) to acquire 70% of Meekom Gold Exchange and Refinery Corp. Ltd. (MGER). The licenses to refine, buy, and sell gold were awarded to MGER in 2009 and renewed in 2013. MGER is under Australian buyers' protection based on an agreement with the United Nations. MGER buys 600 kilograms per year of gold from artisanal miners at a low price (Mining Technology, 2014; Okla, 2014).

Nickel.—In 2014, the Solomon Islands High Court dismissed Sumitomo Metal Mining Co., Ltd. (SMM) of Japan's claims for an exploration license for Isabel nickel project and ruled in favor of Axiom Mining. Axiom Mining was awarded a 50-year exploration license through its subsidiary Axiom KB Ltd., which is a joint venture of Bungusule and Kolosori tribe (20%) and Axiom Mining (80%). In 2014, Axiom Mining resumed exploration activities on Isabel prospect. Axiom KB conducted a drilling survey at the Isabel nickel project to determine the grade of nickel in saprolite beneath the limonite mineralization, and to verify the historical data compiled by International Nickel Company Ltd. (INCO) of Canada and Kaiser Engineering International Inc. (Kaiser Engineering) of the United States. The drilling results showed nickel concentrations of more than 2% and a depth of mineralization that was deeper than indicated by the INCO and Kaiser Engineering data. The development of Isabel nickel mine was expected to start in 2015. The mine's production capacity was expected to be 2 Mt/yr of ore (Axiom Mining Ltd., 2014a, p. 2, 11; 2014b; 2015a, b; Garret, 2014).

In 2014, Axiom Mining partnered with Anitua Ltd. of Papua New Guinea. Anitua provided a loan of $4.1 million (AUD5 million[1]) for the development of the Isabel nickel project. Anitua also agreed to provide services, such as exploration drilling, construction, camp management, and contract mining (Solomon Times Online, 2014a).

Outlook

The economic growth of the Solomon Islands is expected to recover slowly in 2015; the GDP is projected to increase to 3.3% in 2015 from 2.0% in 2014. The recovery of the mineral industry will likely depend on how quickly gold production resumes at the Gold Ridge Mine and on the future of mining projects such as those for bauxite and nickel (Central Bank of Solomon Islands, 2014b, p. 7).

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[1] Where necessary, values have been converted from Australian dollars (AUD) to U.S. dollars (US$) at an average rate of AUD1.23=US$1 for 2014.

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TABLE 1
SOLOMON ISLANDS: PRODUCTION OF MINERAL COMMODITIES[1]

(Kilograms)

Commodity	2010	2011	2012	2013	2014
Gold, mine output, Au content	130	1,641	2,180	1,886	1,403
Silver, mine output, Ag content	--	612	932	413 r	280

rRevised. -- Zero.

[1] Table includes data available through June 22, 2015.

TABLE 2
SOLOMON ISLANDS: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Kilograms)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold:			
Ore	St Barbara Ltd. (100%)	Gold Ridge Mine, Guadalcanal, Guadalcanal Province	1,500 e
Refined	Meekom Gold Exchange and Refinery Corp. Ltd.	NA	700 e
Silver, in ore	St Barbara Ltd. (100%)	Gold Ridge Mine, Guadalcanal, Guadalcanal Province	30

eEstimated. NA Not available.

THE MINERAL INDUSTRY OF SRI LANKA

By Karine M. Renaud

Sri Lanka is endowed with a variety of mineral resources, such as feldspar, clays (including ball clay and kaolin), dolomite, graphite, limestone, mica, mineral sands (including ilmenite, rutile, and zircon), phosphate rock, quartzite, and salt. Sri Lanka is known for its unique type of graphite, which is called vein graphite. The mineral-processing industry produced cement, lead (secondary), iron and steel, and semimanufactures (table 1).

Minerals in the National Economy

In 2014, the real gross domestic product (GDP) increased by 7.4% compared with 7.2% (revised) in 2013 owing to increases in domestic consumption and investments in construction. In 2014, the industrial sector grew by 11% compared with a rate of growth of 9.9% in 2013, and the value of the sector's output accounted for 32% of the GDP compared with 31% (revised) in 2013. Within the industrial sector, the value of mining and quarrying increased by 11% in 2014 compared with an increase of 11.5% in 2013 and accounted for 3.0% of the GDP. In 2014, 79,000 workers (1.0% of the country's population) were employed in the mining and quarrying sector compared with 100,000 workers (1.2% of the country's population) in 2013 (Central Bank of Sri Lanka, 2015a, p. 1, 4; 2015b, p. 94).

Government Policies and Programs

In 2014, the Sri Lanka Exports Development Board said that its goal was to make Sri Lanka a Ceylon Blue sapphires hub by identifying and tendering new gemstone-bearing lands, eliminating unnecessary restrictions and duties for mining companies, and promoting the sapphires. In 2013, the Ministry of State Resources and Enterprise Development was tasked with increasing the profitability of unprofitable and low-profitability state-owned enterprises, such as Lanka Cement Co. Ltd., Lanka Mineral Sands Co. Ltd., Lanka Phosphate Co. Ltd., and Sri Lanka Cement Corp. In 2013, Lanka Mineral Sands Co. and Lanka Phosphate Co. had low profits, and Sri Lanka Cement and Lanka Cement Co. each ran at a loss. The renovations at Lanka Mineral Sands included the installation of new technologies for processing mineral sands at the Pulmoddai factory and the startup of a new factory in Yan Oya. The renovations at the Lanka Phosphate facility included the installation of a new grinding machine for grinding phosphate rock and the installation of a triple superphosphate plant (Ministry of State Resources and Enterprise Development, 2013, p. 17, 19–20; Lanka Business Online, 2015; Sri Lanka Gem and Jewellery Association, 2015).

In June 2013, Sri Lanka's Cabinet of Ministers developed a plan to ban new foreign investments in steelmaking and cement manufacturing, retail trade, and small-scale agriculture to protect domestic investors. The ban did not affect existing investors in these sectors. The Government continued to seek foreign investment in petroleum product refining, shipbuilding, and vehicle manufacturing. In 2014, Sri Lanka offered cement manufacturers and steel industries a 5-year tax holiday followed by a concessionary tax rate of 12% with minimum investment (Lanka Business Online, 2013; U.S. Department of State, 2015, p. 15).

The Government offered tax incentives and imposed fewer regulations on Chinese investors to encourage investment in upgrading Sri Lanka's mining and mineral-processing sectors and developing infrastructure and powerplants. The Government targeted foreign investment for development of the domestic downstream graphite-processing industry, mainly for value-added products. Current investment, mainly from China, was focused on mineral and metal projects other than graphite. A downstream graphite-processing industry was expected to increase tax revenues and jobs, stimulate infrastructure development, and offer other benefits (Salwan, 2013, p. 11; Syrett and Ollett, 2013, p. 19; Wallop, 2013).

Production

In 2014, production of salt increased by 176%; zirconium, 164%; gemstones, 36%; rutile, 28%; lead (secondary), 20%; and limestone, 7%. The production of phosphate rock decreased by 27%; Hi-ilmenite and petroleum refined products, 26% each; ilmenite, 22%; and clay for cement manufacture, 8% (Department of Census and Statistics, 2014, p. 40–41). Data on mineral production are in table 1.

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Mineral Trade

The total value of exports and imports in 2014 was $30.3 billion. Exports increased by 7% and totaled $11.0 billion in 2014 compared with $10.3 billion in 2013, and imports increased by 9% and totaled $19.3 billion in 2014 compared with $17.7 billion (revised) in 2013. In 2014, the value of exports of precious and semiprecious stones increased by 34.7%, and the total value of exports of diamond decreased by 32.1%. The value of mineral exports increased by 29.3%. The mineral commodities exported were gemstones, 12.6 million carats; ilmenite, 20,594 metric tons (t); rutile, 1,999 t; and zircon 1,401 t. Sri Lanka's main export partners were the United States (which received 24.4% of Sri Lanka's exports), the United Kingdom (10.0%), India (5.6%), Italy and Germany (4.5% each), and Russia (2.5%) (Department of Census and Statistics, 2014, p. 2, 32–33, 40).

In 2014, the value of fertilizer imports increased by 15% and the value of petroleum imports increased by 4.8% compared with the values in 2013. Petroleum products accounted for 15%

of total imports; crude oil, 7.4%; and fertilizer, 1.4%. Sri Lanka's main import partners were India (which supplied 20.4% of Sri Lanka's imports), China (17.6%), the United Arab Emirates (9.0%), Singapore (6.5%), Japan (4.8%), and Malaysia (3.7%) (Department of Census and Statistics, 2014, p. 30, 32–33).

Commodity Review

Metals

Lead.—Navam Lanka Ltd., which was the country's sole producer of lead ingot, was 52% owned by Gravita India Ltd. of India through its subsidiaries Gravita Infotech Ltd. (formerly Gravita Exim Ltd.) of India (40%) and Gravita Netherlands B.V. of Australia (12%). In 2014, Gravita Netherlands acquired a 40% stake in Gravita Infotech. In 2014, Navam Lanka produced 4,528 t of secondary lead ingots compared with 3,762 t (revised) in 2013 (Gravita India Ltd., 2015, p. 17).

Titanium and Zirconium (Mineral Sands).—In 2014, Lanka Minerals Sands Co. Ltd., which was a state-owned company, decreased its production of ilmenite owing to a decrease in the international market price to $92 from $320. In order to adjust to international price fluctuations, Lanka Mineral Sands Co. increased production of rutile to 1,800 metric tons per year (t/yr) and zircon to 600 t/yr owing; the international market price of rutile was $700 per metric ton, and that of zircon was $850 per metric ton. The company mined and processed heavy minerals from beach sands and exported the heavy minerals to Japan, Russia, the United Kingdom, and the United States. In 2014, the processing plant, which was located in Pulmoddai on the eastern coast of Sri Lanka, was upgraded and modified; however, owing to a shortage of employees and other facilities, the plant could not operate at its full capacity (Sirimanna, 2014).

Iluka Resources Ltd. of Australia (Iluka Resources) reached an agreement to acquire PKD Resources (Pvt.) Ltd. and four associated mineral-sand tenements and to explore mineral-sand deposits in Puttalam District in North Western Province. The tenements of Iluka Resources in Sri Lanka covered an area of 224 square kilometers (km^2). The total resources were estimated to be 688.1 million metric tons (Mt) (213.9 Mt of measured, 69.9 Mt of indicated, and 404.3 Mt of inferred resources) at an average grade of 8.2% heavy minerals. Ilmenite is the major mineral (in terms of content), with a grade of up to 67%, and rutile and zircon graded up to 4%. Regulations require limiting the percentage of ownership that a foreign company can hold to 40%, although approval for up to 100% ownership could be granted. The company had been granted three other tenements in the area with a combined mineral-sand resource of 56 Mt of heavy minerals, including 37 Mt of ilmenite, 2 Mt of rutile, and 1.9 Mt of zircon. Ilmenite contained in the deposits was suitable as a feedstock for sulfate-route titanium dioxide pigment production. The company also developed acid-soluble synthetic rutile, which could be sold as a high-grade feedstock for the sulfate pigment sector. As of 2014, Iluka Resources continued exploration activities in order to increase its resources and to evaluate the resources for development of a large ilmenite mining operation and sulfate-route processing operations as well as additional investments. In 2014, the company drilled up to 2,000 meters (m) in the Puttalam deposit to confirm historical drilling results and to collect samples for mineralogical testing. Iluka Resources continued to discuss the investment agreement with the Government; the scoping study stage was expected to start in 2015 (Iluka Resources Ltd., 2012; 2013, p. 1, 5; 2014, p. 25, 28–29, 159).

Industrial Minerals

Cement.—Cement production decreased by 2% to 1.89 Mt in 2014 from 1.93 Mt (revised) in 2013 (table 1). Holcim (Lanka) Ltd. privatized the cement plant in Puttalam in 1996. Since then, the workforce at the plant had been cut from 1,500 to 900, of which 370 were permanent workers. In May 2014, 500 contractors at the Holcim plant in Puttalam and a grinding unit in Galle were on strike. The workers demanded permanent jobs, higher wages, and better working conditions. Protesters blocked the main gates at the Puttalam plant, which prevented the transport of cement. The demands of the contractors were not met (Global Cement, 2014; International Global Cement Review, 2015).

In 2013, Tokyo Cement Co., which was a partnership between Nippon Coke and Engineering Co. (formerly Mitsui Mining Co. Ltd.) of Japan and Saint Anthony's Consolidated, planned to build a cement plant (Tokyo Eastern Cement) with a production capacity of 1 million metric tons per year (Mt/yr) at Trincomalee in Eastern Province at an estimated cost of $50 million. The project was to include the construction of a 100-megawatt-capacity biomass-burning powerplant. In 2014, a resolution by the Board of Directors of Tokyo Cement Co. was passed, indicating that a subsidiary of Tokyo Cement Co. (Lanka) Plc—Fuji Cement Co. (Lanka) Ltd. Plc—would merge with Tokyo Cement Co. (Lanka) Plc and retain the name Tokyo Cement Co. (Lanka) Plc. The companies were expected to merge in 2015 (Global Cement, 2013c, 2015).

Thatta Cement Co. (Pvt.) Ltd. (TCCPL) of Pakistan signed a 25-year agreement with the Sri Lanka Ports Authority (SLPA) to set up a cement-grinding and bagging plant at the Port of Hambantota. The total investment was $15 million, and the plant's capacity was expected to be 0.1 Mt/yr in the first year and later to increase to 0.3 Mt/yr. A second expansion, which was planned for later, was expected to increase the plant's capacity to 1 Mt/yr. In 2014, SLPA offered TCCPL a different location for the project, which TCCPL found unsuitable, and the land lease agreement between TCCPL and SLPA was not signed (Global Cement, 2013b; Thatta Cement Co. Ltd., 2015, p. 49).

The Ministry of State Resources and Enterprise Development planned to reopen a cement plant at Kankesanthurai in Northern Province. SLCC submitted a proposal to the Ministry to restart cement production at the Kankesan cement plant. SLCC planned to invest $11.4 million in renovating the entire 0.2-Mt/yr-capacity Kankesan cement plant in Kankesanthurai if SLCC was selected as the main cement supplier for the Northern Highway project. The plant had not been in operation since 1990 because of the security situation in the northern part of the country. In 2014, the Defense and Urban Development Ministry announced that it had acquired the Kankesanthurai cement plant in Jaffna (Global Cement, 2013a; 2015; Ministry of State Resources and Enterprise Development, 2013, p. 24).

Gemstones.—Sri Lanka is known for producing a variety of gemstones, including chrysoberyl, corundum, garnet, ruby, spinel, and tourmaline, and it remained one of the world's leading producers of Ceylon Blue sapphire. The best known areas for gemstone mining in Sri Lanka were Balangoda, Elahera, Kamburupitiya, Moneragala, Okkampitiya, and Ratnapura. In 2014, Gemfields plc. of the United Kingdom entered into a joint-venture agreement with East West Gem Investments Ltd. (EWGI) of Jersey [United Kingdom] to explore for sapphire and other gemstones through three Sri Lankan subsidiaries. According to the agreement, Gemfields acquired a 75% interest for $400,000 and EWGI held the remaining 25% interest in 16 exploration licenses. The companies also planned to create a gemstone trading company, Ratnapura Lanka Gemstones (Pvt) Ltd., that would trade rough sapphire (Geological Survey and Mines Bureau, 2012, p. 24; Brighouse, 2014; Business Wire, 2014; National Gem and Jewellery Authority, 2014; Thomson Reuters, 2014).

Graphite.—The deepest of Sri Lanka's high-carbon-grade occurrences were located at depths of between 400 and 600 m. In 2014, graphite was produced at the two largest graphite mines in Sri Lanka—the Bogala and the Kahatagaha Mines. The companies that operated graphite mines in Sri Lanka were Graphite Lanka Ltd. and Bogala Graphite Lanka Plc, which was a unit of AMG Mining AG (87%). In 2013, several companies, including Bora Bora Resources Ltd. (BBR) of Australia, MRL Corp. Ltd. of Australia, and Saint Jean Carbon Inc. of Canada entered into agreements to explore for and develop graphite in Sri Lanka (Geological Survey and Mines Bureau, 2012, p. 19; Ministry of Industry and Commerce, 2013, p. 2).

Bogala received approval to explore graphite deposits in a 56-km^2 area in Kaluthara (including Matugama) and the 33-km^2 area of Kegalle (including Galigamuwa, Kohombagahawatte, and Rangala), for a total area of 89 km^2. In 2013, Bogala faced electricity rate increases of 30% in April and royalty rate increases of 2% in November. In 2014, Bogala applied to the Sri Lanka Geological Survey and Mines Bureau for a mining license for the Rangala Mine, which is located 8 kilometers (km) southeast of the Bogala Mine and was wholly owned by Bogala. The cost of opening the mine had not been estimated yet (Bogala Graphite Lanka Plc., 2013, p. 6; 2014, p. 5; ColomboPage, 2013).

In 2013, Saint Jean Carbon Inc. (formerly Torch River Resources Ltd.), entered into an agreement with Han Tal Graphite (Pvt.) Ltd. of Sri Lanka for the acquisition of 113 lump-vein graphite mining claims at 56 historical mines and exploration and development licenses for a 113-km^2 area in southwestern Sri Lanka. The mines could be reactivated within 12 to 24 months following startup work that would include a resource estimate and an economic feasibility study. In 2014, Saint Jean Carbon announced that it had received conditional approval from TSX Venture Exchange to acquire 133 lump-vein graphite mining claims (Market Wired, 2013a, b; Saint Jean Carbon Inc., 2014).

In 2014, BBR entered into a binding Heads of Agreement with RS Mines (Pvt) Ltd. to acquire 50% of the Queens Graphite Mine at a cost of $66,097 (AUD$100,000)[1] and to conduct due diligence with respect to production at the Queens Graphite Mine and at the graphene oxide production facilities located 2 km north of the Kahatagaha Graphite Mine near Kurunegala-Kandy. In April, BBR acquired a 75% interest in tenements of the Matale vein-graphite project near Kandy; the remaining 25% was held by Sri Lanka's Esna Business Advisory Group. In addition to the Matale project, BBR acquired 100% of Plumbago Mining (Pty.) Ltd. as a part of the deal. Plumbago Mining held 75% of Plumbago Lanka (Pvt.) Ltd., which was the owner of a 24-km^2 area tenement in the Wanni Complex, as well as two other areas in the complex. The Matale-Kurunegala project covers a 32-km^2 area for which exploration licenses have been obtained and 109 km^2 for which exploration applications have been submitted. The project area surrounds a region that includes the three state-owned Kahatagaha-Kolongaha graphite mines. In November 2013, BBR conducted an Airborne Versatile Time-Domain Electromagnetic (VTEM) survey of the Matale-Kurunegala project. In March 2014, the results of the VTEM survey showed potential for mineralization containing 90% graphitic carbon and covering a 5-km^2 area at the Kingfisher prospect. The Kingfisher prospect, which is located 10 km north of the town of Melsiripura in central Sri Lanka, contained an old pit and workings from artisanal operations. The Paragoda north and south project covers 62 km^2 in central Sri Lanka. In 2014, the license for the Paragoda project was renewed for 2 years by the Geological Survey and Mines Bureau. During geologic mapping of the Paragoda project, 41 historic pits, 22 adits, and 19 shafts were identified. BBR planned to conduct an onground geophysical survey of its southern projects, which included the Ambalangoda, the Baduralia, and the Neluwa projects. The company was able to negotiate for a high percentage of foreign ownership under the Mining Act and to obtain a 12-year exemption from income tax and import duties (Bora Bora Resources Ltd., 2012, p. 7; 2014; 2015, p. 5–6; Asia Miner, 2013).

In October, MRL Corp. Ltd. (also known as MRF) (formerly Mongolia Resources Ltd. and Robe Australia Ltd.) of Australia reached an agreement through its subsidiary MRL Investment (Pvt.) Ltd. with Supreme Solutions (Pvt.) Ltd. to acquire a major share of MRL Graphite (Pvt.) Ltd. MRL Graphite held 45 exploration licenses for a high-potential graphite project that covers an area of 45 km^2 and includes the Hikkaduwa, the Palinda Nuwara, and the Warakapola areas. In 2014, MRL signed a drilling contract with the Geological Survey and Mines Bureau to drill at three locations in the Pandeniya-Bopitiya and the Warakapola areas. The first drill hole was in the Pandeniya area at intervals of 50 to 125 m. The second and third drill holes were to trays of vein graphite mineralization below the historical shafts and adits; the holes were 300 m deep. In 2014, MRF applied for an industrial mining license for the Pandeniya area. The mining operations were expected to start by the end of 2015 (Mongolian Resources Ltd., 2013a, p. 4; 2013b, p. 5; MRL Corp. Ltd., 2013; 2015, p. 5; Asia Miner, 2014).

In 2014, MRF was granted the Aluketiya mining license and the Pujapitiya project license for the area south of the

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[1] Where necessary, values have been converted from Australian dollars (AUD) to U.S. dollars (US$) at an average exchange rate of AUD1.23=US$1.00 for 2014.

Kahatagaha-Kolongaha Mines, which included a graphite mine located at Meegahatenna in Walallawita District. The Pujapitiya project exploration license covered an area of 18 km^2. Based on information from the developed shafts, the geology of the Aluketiya Mine is composed of sillimanite-biotite granitic gneiss (garnet granitic gneiss) and charnockite. The graphite veins are Proterozoic age and were remobilized by volcanic events. Veins are from 50 to 70 m deep and from 30 to 50 m wide; graphite occurs in the form of needles and grades between 75% and 85% carbon. Chemical analyses of the two main graphite veins showed them to be from 95% to 99% carbon. The company proposed using a hand-held method to extract graphite in Aluketiya (MRL Corp. Ltd., 2015, p. 5–6).

Phosphate Rock.—In 2014, phosphate rock production decreased to 36,000 t owing to a phosphate rock shortage. State-owned Sri Lanka Phosphate Ltd. was the only company that mined phosphate rock in Sri Lanka and supplied it to the phosphorus fertilizer industry. Sri Lanka Phosphate was unable to meet domestic fertilizer demand owing to a supply delay caused in part by the need for repairs at its grinding mill (Cohen, 2014; Daily Mirror, 2014).

Salt.—In 2014, salt production increased by 176% compared with that of 2013. Salt was extracted from the Puttalam and the Bata-Atha salterns. The Kingdom of Raigam (a diverse group of companies incorporated in Sri Lanka) was planning to stop importing salt within the next 2 to 3 years. In 2014, the Bata-Atha salterns contributed to increased salt production owing to better weather conditions during the year. In 2013, the Kingdom of Raigam, in cooperation with smaller companies, invested $7.65 million (1 billion rupees)[2] to construct the country's largest salt refinery in Puttalam. The Kingdom of Raigam was expected to expand the pure vacuum-dry salt plant in Puttalam and to increase salt production at the group's three refineries to 500,000 t/yr by 2015 (Ceylon Today, 2013; Raigam Wayamba Salterns Plc., 2013, p. 7; 2015, p. 10).

Mineral Fuels

Petroleum.—Petroleum refinery production decreased by 26% in 2014 owing to a shutdown of the Ceylon Petroleum Corp.'s (CPC's) Sapugaskanda oil refinery in the second quarter of 2014 because of the failure of the crude oil buoy. Output from CPC's Sapugaskanda oil refinery satisfied one-third of the country's petroleum requirement. In 2012, the United States, European countries, and other countries imposed sanctions on Iran's energy and financial sectors. Countries agreed to stop purchasing oil from Iran. In 2013, owing to the sanctions, CPC stopped purchasing light crude oil and bitumen from Iran, and in 2014, CPC purchased crude oil from other sources. CPC faced challenges in finding an alternative crude oil mix. The blend consisting of 80% Abu Dhabi Murban and 20% Oman crude oil was suitable for the Sapugaskanda refinery; however, the mix was not economical and (or) practical because of the high price of Murban crude oil. Iran had been a major supplier of bitumen and oil for CPC. CPC also faced delays in completing the $1.5 million modernization of its Sapugaskanda oil refinery. The delays resulted in decreases in production and increases in the prices of refined oil products sold by the facility (Ministry of Petroleum Industries, 2013, p. 16, 20–21; 2014, p. 30, 65–66; Central Bank of Sri Lanka, 2014, p. 82).

In 2011, Cairn Lanka (Pty) Ltd. of Sri Lanka (a wholly owned subsidiary of CIG Mauritius Holdings (Pty) Ltd. of Mauritius, which in turn was a subsidiary of Cairn India Ltd. of India) discovered two gas and condensate basins in Mannar District. In 2013, the Petroleum Resources Development Secretariat conducted a second round of international offshore exploration licensing on 13 blocks in the Cauvery and Mannar Basins, which are located on the northeastern shallow continental shelf of Sri Lanka. In addition, six offshore ultradeepwater blocks from the southwest to the northeast were identified and were expected to be offered as a joint study. In 2014, Cairn Lanka planned to conduct a three-dimensional seismic survey to evaluate the potential of the Mannar Basin (Central Bank of Sri Lanka, 2014, p. 82; Cairn India Ltd., 2015, p. 9, 13).

Outlook

Sri Lanka's graphite production and mineral sands production are expected to increase owing to Government and foreign investment and company expansions. The country is expected to expand its gemstone production as a result of private investment and new exploration.

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[2] Where necessary, values have been converted from Sri Lanka rupees (LKR) to U.S. dollars (US$) at an average exchange rate of LKR130.7=US$1.00 for 2013.

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TABLE 1

SRI LANKA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2010	2011	2012	2013	2014
METALS						
Iron and steel, metal, semimanufactures		75,000	76,000	75,000	76,000	77,000
Lead, secondary[4]		1,000 [r]	2,000 [r]	2,100	3,762 [r]	4,528
Titanium mineral concentrates, gross weight:[4]						
Ilmenite		48,177 [r]	62,665 [r]	39,518 [r]	37,904 [r]	29,420
Hi-Ilmenite		5,184	5,130	4,589	4,780	3,551
Rutile		2,493 [r]	1,970 [r]	1,589 [r]	1,406 [r]	1,800
Zirconium, zircon concentrates, gross weight[4]		797 [r]	641 [r]	292 [r]	227 [r]	600
INDUSTRIAL MINERALS						
Cement, hydraulic[4]	thousand metric tons	1,737 [r]	1,984 [r]	2,066 [r]	1,929 [r]	1,885
Clays:						
Ball clay		47,826 [4]	50,000	52,000	54,000	55,000
Clays for cement manufacture		1,000	1,100	1,200	1,200	1,100
Kaolin		8,207 [4]	11,157 [r, 4]	11,805 [r, 4]	12,990 [r, 4]	13,000
Feldspar, crude and ground		75,405 [4]	53,000 [r, 4]	55,000 [4]	57,000 [r, 4]	57,500
Gemstones:						
Alexandrite	carats	2,000	3,000	3,000	3,000	7,000
Cat's eye	do.	54,000	55,000	56,000	66,000 [r]	95,000
Diamond	do.	400,000	300,000	300,000	300,000	400,000
Pathmaraga	do.	5,000	2,600	3,300	4,300	4,400
Ruby	do.	31,336 [4]	35,000	38,000	41,000	40,000
Sapphire	do.	1,491,698 [4]	1,600,000 [r]	2,000,000 [r]	2,500,000 [r]	3,800,000
Other	do.	2,500,000	2,400,000 [r]	2,500,000 [r]	2,500,000 [r]	3,000,000
Total	do.	4,484,034	4,395,600	4,900,300	5,414,300	7,346,400
Graphite, all grades		3,437 [4]	3,357 [4]	4,071 [4]	4,200	4,000
Mica, scrap		2,095 [4]	2,927 [r, 4]	1,260 [r, 4]	1,493 [r]	1,500
Phosphate rock, gross weight[4]		46,309 [r]	58,525 [r]	47,559 [r]	49,106 [r]	36,000
Salt[4]		73,795 [r]	61,857 [r]	63,861 [r]	36,920 [r]	102,023
Stone:						
Limestone	thousand metric tons	1,192 [4]	1,200	1,300	1,400	1,500
Quartzite		34,437 [4]	36,000	37,000	38,000	39,000
MINERAL FUELS AND RELATED MATERIALS						
Petroleum refinery products:						
Gasoline[4]	thousand 42-gallon barrels	1,348 [r]	1,761 [r]	1,293 [r]	1,228 [r]	675
Jet fuel[4]	do.	1,125 [r]	1,383 [r]	829 [r]	1,108 [r]	704
Kerosene[4]	do.	717 [r]	718 [r]	579 [r]	443 [r]	303
Distillate fuel oil[4]	do.	3,294 [r]	3,738 [r]	2,940 [r]	2,907 [r]	1,919

See footnotes at end of table.

TABLE 1—Continued
SRI LANKA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2010	2011	2012	2013	2014
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum refinery products:—Continued						
Residual fuel oil[4]	do.	2,638 [r]	3,202 [r]	2,428 [r]	3,471 [r]	2,141
Refinery fuel and losses	do.	750 [r]	760 [r]	800 [r]	820 [r]	840
Other	do.	2,600 [r]	2,700 [r]	2,800 [r]	2,900 [r]	3,000
Total	do.	12,500	14,300	11,700	12,900	9,600

[r] Revised. do. Ditto.

[1] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2] Table includes data available through November 21, 2015.

[3] In addition to the commodities listed, crude construction materials, such as calcite, clay for brick and tile, dolomite, sand and gravel, sulfur, secondary aluminum, and varieties of stone presumably were produced, but available information was inadequate to make reliable estimates of output.

[4] Reported figure.

TABLE 2
SRI LANKA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Aluminum, secondary		Castalloy	Colombo	1
Do.		Lanka Aluminium Industries	do.	NA
Do.		Zenith Aluminium Co.	do.	NA
Do.		Alumex Ltd.	Gonawala	1
Do.		Alumex (Pvt.) Ltd.	Makola	NA
Do.		Lanka Refractories Ltd.	Meepe, Padukka	8
Cement		Holcim (Lanka) Ltd. (part of Holcim Ltd.)	Cement plant at Puttalam and grinding unit in Galle	1,400
Do.		Sri Lanka Cement Corp. (Ministry of Industry and Commerce)	Kankesanthurai	200
Do.		do.	Puttalam	400
Do.		Tokyo Cement Co. (Lanka) Plc.	Trincomalee grinding unit and 2 mills	1,800
Clay, ball		Lanka Ceramic Ltd.	Dediyawala	NA
Graphite		Kahatagaha Graphite Lanka Ltd. (Ministry of Industry and Commerce)	Kahatagaha Mine	6
Do.		Bogala Graphite Lanka Plc. (AMG Mining AG, 87%, and others, 13%)	Bogala Mine	7
Do.		Sakura Pvt. Ltd.	Ragedara Mine	NA
Lead, secondary		Navam Lanka Ltd. (Gravita India Ltd., 52%)	Marigama Export Processing Zone, Marigama, Gampha District	7
Limestone		Holcim (Lanka) Ltd. (part of Holcim Ltd.)	Arawakalu quarry	750
Petroleum, refined	42-gallon barrels per day	Ceylon Petroleum Corp. (Ministry of Petroleum and Petroleum Resources Development)	Sapugaskanda	50,000
Do.	do.	Lanka Indian Oil Co. (Indian Oil Corp. Ltd., 75%)	Colombo	NA
Phosphate rock		Lanka Phosphate Co. Ltd. (Ministry of State Resources and Enterprise Development)	Eppawala	36
Salt		Puttalam Salt Ltd. (Raigam Wayamba Saltern Plc.)	Puttalam, Puttalam saltern	30
Do.		Southern Salt (Pvt.) Ltd. (Raigam Wayamba Saltern Plc.)	Ranna, Bata-Atha salterns	NA
Steel, semimanufactures		Ceylon Steel Corp. Ltd.	Oruwala, Athurugiriya	250
Do.		Melwire Rolling (Pvt.) Ltd.	Colombo	NA
Do.		GTB Colombo Corp. (Pvt.) Ltd.	do.	NA
Do.		Elsteel Pvt. Ltd.	Katunayake	NA
Do.		Melbourne Metal Industries Ltd.	Colombo	NA
Do.		Bhuwalka Steel Industries Ltd.	do.	25
Titanium, mineral sands		Lanka Mineral Sands Co. Ltd. (Ministry of State Resources and Enterprise Development)	Pulmoddai	150
Do.		Mirama Minerals	Dambulla	NA

[e] Estimated. Do., do. Ditto. NA Not available.

THE MINERAL INDUSTRY OF TAIWAN

By Lin Shi

Taiwan is an island with a limited amount of mineral resources. In 2014, Taiwan's gross domestic product (GDP) increased by 3.8% to about $530 billion compared with an increase of 2.2% (revised) in 2013 and 2.1% (revised) in 2012. The mining and quarrying sector accounted for a 0.1% share of the GDP. The service sector accounted for about 64% of the GDP, and the industrial sector accounted for about 34%. Taiwan's economy was export oriented and depended on world demand and commodity prices. The total value of exports increased by 2.7% in 2014 compared with that of 2013. Exports from Taiwan to Central America increased by 7.9%; those to North America, by 6.7%; the Middle East, by 6.5%; Europe, 3.1%, and Asia, 2.6%. Exports from Taiwan to South America decreased by 7.7%, and those to Africa decreased by 16.9%. China (including the Hong Kong Special Administrative Region) was the leading destination for Taiwan's exports and received 39.7% of the total value of its exports, followed by the United States, which received 11.1%. Electronics, machinery, and petrochemicals remained Taiwan's leading export commodities. Mineral products accounted for 10% of the total value of exports (Bureau of Foreign Trade, 2015; Taiwan Statistical Bureau, 2015).

Minerals in the National Economy

Mineral resources of significance included metallic minerals, such as copper, gold, iron, and silver; nonmetallic minerals, such as dolomite, fire clay, limestone, marble, serpentine, silica sand, sulfur, and talc; and mineral fuels, such as coal, natural gas, and petroleum. After several decades of mining, however, nearly all recoverable coal, metallic minerals, and talc had been depleted. The output of the mineral industry, which accounted for a very small portion of Taiwan's economy, was less than 1% of total industrial production. In 2014, Taiwan had a total of 254 mines (excluding offshore mines) on the island, of which 189 mines (74.4% of the total) were active, including 1 new mine located in Tainan City that was established to explore for natural gas; 59 mines (23.2%) were inactive; and 6 mines (2.4%) had suspended operations. As of the end of 2014, 2,757 people were employed in the mineral industry (Bureau of Mines, 2015, p. 15–16; Taiwan Statistical Bureau, 2015).

Production

Limestone and marble were mined on the eastern part of Taiwan, and natural gas and petroleum were produced on the western part of the island. Sulfur was the island's most valuable mineral commodity other than natural gas and marble. Because the island had no domestic primary aluminum, copper, lead, or zinc smelting capacity, downstream metal producers relied on imports of ingots and scrap to produce products from these metals. Owing to high labor costs, environmental problems, and weak internal demand, the output of these industries had decreased gradually during the past several years, and companies had moved their manufacturing facilities to mainland China and to countries in Southeast Asia. In 2014, production of limestone, natural gas, serpentine, silica sand, and sulfur increased, but that of marble and petroleum decreased (table 1; Bureau of Mines, 2015, p. 18).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Commodity Review

Metals

Aluminum.—In 2014, Taiwan produced 352,650 metric tons (t) of aluminum and aluminum alloy ingots, 191,967 t of fabricated aluminum, and 166,481 t of aluminum sheet. CS Aluminum Corp. [a subsidiary of China Steel Corp. (CSC)] began its Phase II expansion project in 2011, which was expected to increase its production of aluminum products. Upon completion in 2014, the company reached a production capacity of 266,000 metric tons per year of aluminum (CS Aluminum Corp., 2015; Ministry of Economic Affairs, 2015).

Copper.—In 2014, Taiwan did not produce refined copper and relied on imports to meet its copper demand. The country processed or produced 103,656 t of copper alloy bar; 104,670 t of copper foil; 105,597 t of copper alloy wire; and 168,728 t of fabricated copper. Refined copper was imported mainly from Australia, Chile, the Democratic Republic of the Congo [Congo (Kinshasa)], Japan, and Peru; copper alloy was imported from Japan, the Republic of Korea, Russia, and Ukraine. The electronics sector was the major consumer of copper and copper products on the island (Ministry of Economic Affairs, 2015).

Iron and Steel and Iron Ore.—In 2014, Taiwan produced 5,651 t of steel ingot; 52,940 t of iron pipe; and about 22.5 million metric tons (Mt) of carbon steel slabs and billets. The increased steel production was attributable to the 2013 startup of a new blast furnace by Dragon Steel Corp., which was a subsidiary of CSC (Ministry of Economic Affairs, 2015).

CSC was the only integrated iron and steel producer on the island and had invested $6.7 billion to increase the company's output capacity to 20 million metric tons per year (Mt/yr) during the next several years. The company's subsidiary, Dragon Steel, had completed the construction of a 2.5-Mt/yr blast furnace in 2010 and the installation of a second 2.5-Mt/yr blast furnace in 2013. In 2014, it was in the process of completing its Phase II expansion project to increase its capacity to 6.2 Mt/yr of crude steel, of which 1.2 Mt/yr of crude steel would be produced from an electric arc furnace. CSC and Dragon Steel combined had a total output capacity of more than 16 Mt/yr of crude steel (China Steel Corp., 2014).

Taiwan had no iron ore resources and relied on imports, mainly from Australia, Brazil, and Canada, to meet its iron ore demand. Imports of iron ore were expected to continue to increase as Dragon Steel's operations expanded. During the past several years, CSC had made efforts to secure iron ore resources from abroad. A consortium between CSC's subsidiary CSC Steel Australia Holding Pty Ltd. and Pohang Iron and Steel Corp. (POSCO) of the Republic of Korea had invested $290 million and acquired a 3.95% share of ArcelorMittal Mines' iron ore project in Canada in 2013. CSC and POSCO combined held a 15% stake in the ArcelorMittal Mines iron ore project. CSC would receive 1 Mt/yr of iron ore from ArcelorMittal Mines as part of the acquisition agreement (ArcelorMittal Mines Canada, 2013).

Industrial Minerals

Cement.—Most of Taiwan's cement producers were located on the eastern part of the island and together accounted for more than 80% of the country's total cement output capacity. Owing to a lack of limestone resources and a limited market on the island, many local cement producers gradually moved their production facilities to mainland China in the late 1990s to expand their output capacities. In 2014, Taiwan's output capacity of cement was about 26 Mt/yr; it produced about 15 Mt, and it consumed about 13 Mt. About 3 Mt of cement was exported to Ghana, Indonesia, Malaysia, Mauritius, Singapore, the United States, and other countries. Taiwan's cement consumption had decreased gradually to a low of about 12 Mt/yr in recent years from 28 Mt/yr in the 1990s; cement exports had increased to 4.26 Mt in 2013 and decreased to 3 Mt in 2014. Imported cement came from China, Japan, the Republic of Korea, and Vietnam; the quantity of imports had been about 1.37 Mt/yr in both 2012 and 2013, and decreased to 1.25 Mt in 2014. Cement prices remained relatively stable from 2013 to 2014 at $4.60 per 50-kilogram bag (Global Cement Report, The, 2015, p. 338–339).

Mineral Fuels and Related Materials

Coal.—Coal was no longer mined in Taiwan, which depended on imports to meet its demand. Taiwan Power Co. was the leading coal consumer followed by the cement and iron and steel sectors. In 2014, Taiwan's total coal supply was 65.78 Mt and its consumption was 63.86 Mt. Coal imports decreased by 0.24% in 2014 from the amount imported in 2013; about 48% of the imported coal was used for power generation, about 27% was used for coking coal production, and about 4% was used for basic metal production. Thermal coal was imported mainly from Australia, China, Indonesia, Russia, and South Africa (Bureau of Energy, 2015a).

Natural Gas and Petroleum.—In 2014, Taiwan produced 387 million cubic meters of natural gas, of which residential use accounted for about 52%; industrial use, about 27%; services, about 20%; and power generation, about 0.3%. The total amount of imported liquefied natural gas (LNG) was 17.7 billion cubic meters, and the total consumption of LNG was 16.5 billion cubic meters, of which power generation accounted for about 86%; industrial use, about 11%; services, about 2%; and residential use, about 0.3%. With limited mineral fuel resources, Taiwan produced less than 1% of its petroleum requirements and relied on imports to meet the remaining demand—mainly through long-term contracts with Angola, Iraq, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates (Bureau of Energy, 2015b).

Outlook

Taiwan's economic growth is heavily dependent on external trade. The economic recovery in the United States and other developed countries is expected to increase the demand for Taiwan's exports. Given the island's limited mineral resources, the mineral sector is expected to have only a minimal effect on its economy in the future. The growth of mineral commodity manufacturing relies on imports of raw materials to support Taiwan's iron and steel and nonferrous metals sectors. The prices of the raw materials affect the volume and value of production. The tightening environmental regulations could cause nonferrous metals and steel producers to relocate their production facilities to mineral-rich countries with lower labor costs. The Taiwan authorities proposed a new law governing the oversight of cross-Strait agreements in early 2014 that would delay implementation of any additional economic arrangements with China (U.S. Central Intelligence Agency, 2015). Economic growth in Taiwan is expected to increase slowly during the next few years and to be more dependent on the economic growth in the Asia and the Pacific region.

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TABLE 1

TAIWAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2010	2011	2012	2013	2014
METALS						
Iron and steel:						
Pig iron	thousand metric tons	9,358	12,940	11,800	13,400	14,400 [e]
Steel, crude	do.	18,975	21,640 [r]	19,927	21,466	22,511
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	16,301	16,852	15,808 [r]	16,554 [r]	14,592
Lime		321,561 [r]	318,064 [r]	286,808 [r]	282,057 [r]	260,717
Mica		--	-- [r]	-- [r]	-- [r]	5,016
Silica sand		305,882	173,354	58,157	61,718	131,652
Sodium compounds, caustic soda		1,782,680	1,693,241	1,727,597	1,738,858 [r]	1,707,262
Stone:						
Dolomite		117,466	67,459	47,488 [r]	37,755 [r]	22,196
Limestone		50,550 [r]	7,144 [r]	6,357 [r]	9,079 [r]	30,055
Marble (raw material)	thousand metric tons	25,134 [r]	24,365 [r]	22,540 [r]	21,729 [r]	20,568
Serpentine (raw material)		110,805 [r]	76,890 [r]	60,663 [r]	93,610 [r]	137,959
Sulfur		231,700	219,975	231,296	192,292 [r]	195,280
Talc		360	659 [r]	778 [r]	362 [r]	133
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural, gross	million cubic meters	296 [r]	330	442	381 [r]	387
Petroleum, crude	thousand 42-gallon barrels	89 [r]	71	72	66	57

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. do. Ditto. -- Zero.

[1] Table includes data available through October 26, 2015.

TABLE 2
TAIWAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilitites	Annual capacity[e]
Cement		Asia Cement Corp.	Hsinchu	1,800
Do.		do.	Hualien	4,020
Do.		Chia Hsin Cement Corp.	Kaohsiung	1,860
Do.		Chien Tai Cement Co. Ltd.	do.	1,720
Do.		Lucky Cement Corp.	Tungao	2,000
Do.		Southeast Cement Corp.	Kaohsiung	1,090
Do.		do.	Chutung	1,400
Do.		Taiwan Cement Corp.	Hualien	1,600
Do.		do.	Hualien Hsien	5,600
Do.		do.	Suao	3,400
Do.		Universal Cement Corp.	Kaohsiung	1,550
Iron and steel:				
Pig iron		China Steel Corp.	do.	9,900
Do.		Dragon Steel Corp. (China Steel Corp.)	Taichung	6,200
Steel, crude		An Feng Steel Co. Ltd.	Kaohsiung	2,000
Do.		China Steel Corp.	do.	9,900
Do.		Dragon Steel Corp. (China Steel Corp.)	Taichung	6,200
Do.		Feng Hsin Iron and Steel Co. Ltd.	Kaohsiung	1,200
Do.		Hai Kwang Enterprise Corp	do.	600
Do.		Tang Eng Stainless Steel Plant	do.	300
Do.		Yieh Hsing Enterprise Co. Ltd.	do.	450
Do.		Yieh Phui Enterprise Co. Ltd.	do.	1,300
Do.		Yieh United Steel Co.	do.	1,000
Marble		Taiwan Marble Co., Ltd.	Panchiao	15
Nickel		Taiwan Nickel Refinery	Kaohsiung	14
Petroleum:				
Crude	thousand 42-gallon barrels	Chinese Petroleum Corp.	Chuhuangkeng and Tungtzuchiao	850
Refinery products	do.	do.	Kaohsiung	570
Do.	do.	do.	Taoyuan	200
Do.	do.	Formosa Plastics Group	Yunlin	450
Sulfur		China Petrochemical Development Corp.	Taipei	280

[e] Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.

THE MINERAL INDUSTRY OF THAILAND

By Yolanda Fong-Sam

In 2014, the real rate of growth of Thailand's gross domestic product (GDP) increased by less than 1% compared with growth of 2.9% in 2013. Thailand's mineral production (including mineral fuels) decreased by 2.7% in 2014 compared with that of 2013, and that of its construction sector decreased by 4.4%. Several events, including a magnitude 6.0 earthquake and political instability, affected Thailand's economy negatively in 2014 (Bank of Thailand, 2014; 2015c, p. 1; Disaster Report, 2014; Noble, 2014; Asian Development Bank, 2015).

In 2014, the total foreign direct investment in Thailand was valued at $12.8 billion (which was a decrease of 11% compared with that of 2013), from which 0.9% was invested in the mining and quarrying sector and 1.7% was invested in the construction sector. The investment environment in the country slowed in 2014 as most businesses continued to put off investments as they awaited signs of economic recovery and the Government's announcement of infrastructure investments (Bank of Thailand, 2015a; 2015c, p. 1–2).

Minerals in the National Economy

In 2014, Thailand was one of the world's leading producers of feldspar (5.5% of world production), gypsum (2.6%), cement (0.8%), and tin (0.07%). The country's identified mineral resources were being exploited mainly for domestic consumption and export. Thailand's manufacturing sector was considered very important to the country's economy, as it represented more than 30% of the country's GDP. Thailand's mining industries produced metals, such as copper, gold, iron, lead, manganese, silver, tungsten, and zinc, and a variety of industrial minerals, such as barite, clays, salt, sand, and stones (table 1; Anderson, 2016; Crangle, 2016; Tanner, 2016; van Oss, 2016).

Government Policies and Programs

In March 2014, Thailand's Parliament approved the Mineral and Petroleum Resources Development (MPRDA) bill. The purpose of the MPRDA bill was to amend and eliminate ambiguities encountered in the MPRDA Act 28 of 2002 as amended by the 2008 MPRDA Amendment Act. The new bill was designed to align the MPRDA with the Geoscience Act of 1993, add to sanction regulations, improve the mining regulatory system, lay out rights and enhance provisions related to the beneficiation of minerals, promote national energy security, provide regulations for associated minerals, and restructure administrative processes. For instance, the MPRDA bill proposed increasing sanctions for mining offenses by charging fines based on the percentage of the right holder's annual revenue accrued in country and its exports from the preceding year, rather than charging a set fine. The percentage varies from 5% to 10%, depending on the nature of the offense. In terms of beneficiation, the MPRDA bill promotes the local beneficiation of mineral resources to support the increase of local capacity. Beneficiation, as defined by the bill, refers to the addition of value or transformation of a mineral to a higher value product for domestic consumption or exportation. An associated mineral, as defined in the bill, is any mineral that is mineralogically associated with the primary mineral being mined and is located in the same deposit within the area of the mining license, and for which it is impossible to mine the primary mineral without also mining the associated mineral. The bill stipulates that any mining license holder can also mine and dispose of any mineral associated with the primary mineral, although the license holder is not licensed to mine the associated mineral (Beech, 2014).

In July, the Government announced Thailand's Mining Fiscal Regime—H1 2014 Report. The report outlines the governing bodies, governing laws, mining ownership and licenses, mining rights and obligations, and key fiscal terms covering the following commodities—coal, copper, gold, iron ore, and silver. The country's mining industry is overseen by the Ministry of Energy (MoE), the Ministry of Industry (MoI), and the Ministry of Natural Resources and Environment (MoNRE). The MoE is responsible for sustainable energy management to promote a stable environment for energy prices, and to increase the competitiveness of the production sector. The Department of Mineral Fuels, which is under the MoE, is the governmental agency responsible for overseeing the petroleum industries in the country; it promotes petroleum exploration and exploitation and development of the domestic petroleum supply. The MoI is the principal Government agency that oversees the country's mineral sector and the implementation of the Mineral Act. The Department of Primary Industries and Mines (DPIM), which is under the MoI, is responsible for the development of mining and primary industries, which make direct use of natural resources. It also oversees, supervises, promotes, and supports mining and metallurgical activities to fulfill the demands for sustainable utilization of Thailand's mineral resources while providing for public safety and protecting the environment in compliance with the Mineral Act. The DPIM also provides technical assistance to the metallurgical, mineral-processing, and mining industries. The Department of Mineral Resources (DMR), which is under the MoNRE, drafts national mineral policies and provides technical assistance for geologic prospecting and mineral exploration. The DMR conducts geologic mapping, manages mineral resources, performs mineral analyses, and administers the country's mineral resources information center (Department of Primary Industries and Mines, 2014; Wood, 2014; Department of Energy, 2015).

Production

In 2014, Thailand's production increased for monazite (43%), rare-earth oxides (37.5%), zinc, zinc content (30%), tin concentrate (18%), and copper (13%). Decreases were reported for primary zinc metal (16%), zinc alloys (13%), and iron ore (11%). In the industrial minerals sector, increases were reported for perlite (279%) following production difficulties in 2013, feldspar (32%), marble (32%), barite (26%), and silica sand (24%). Decreases were reported for marl (98%) and quartz (51%). The country produced about the same amount of mineral fuels in 2014 as in 2013 (table 1).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities in Thailand. Most of the nonfuel mineral mining and mineral-processing companies in Thailand were privately owned and operated. The Electricity Generating Authority of Thailand (EGAT) and several coal mining companies owned and operated most of the country's major coal exploration and mining businesses. The Petroleum Authority of Thailand (PTT), the PTT Exploration and Production Public Co. Ltd. (PTTEP) and its joint ventures, and major multinational oil companies owned most of the country's petroleum and natural gas exploration projects and exploitation businesses. Thailand's mineral industry involved the mining and processing of metallic and industrial minerals and the production of crude oil and natural gas (table 2).

Mineral Trade

In 2014, Thailand's exports were valued at about $227.5 billion compared with $228.5 billion in 2013, which was a decrease of 0.4%. Imports were valued at about $227.7 billion compared with $250.4 billion in 2013, which was a decrease of 9%. In 2014, Thailand exported petroleum products, which were valued at $11.4 billion and represented about 5% of total exports. Exports of mineral commodities were valued at $9.6 billion, which represented 4.2% of total exports and included such commodities as aluminum, copper, iron and steel, and other metals. Exports of nonmonetary gold were valued at $2.8 billion, which represented about 1.2% of total exports. Thailand's main export partners in 2014 were China (11%), the United States (10.5%), Japan (9.5%), Malaysia (5.6%), and Hong Kong (5.5%) (Bank of Thailand, 2015d, e).

Thailand imported raw materials and intermediate goods, including fuel (crude oil, coal, coke, natural gas, peat, and petroleum products) valued at $47.5 billion, which represented about 21% of total imports; base metal materials valued at $19.6 billion, or 8.6% of total imports; nonmonetary gold valued at $6.6 billion, or about 3% of total imports; and minerals (unspecified) valued at $2.6 billion, or 1.1% of total imports. Thailand's main import partners were China (17%), Japan (15.6%), the United States (6.4%), and Malaysia and the United Arab Emirates (5.6% each) (Bank of Thailand, 2015b, e).

Commodity Review

Metals

Copper.—As of December 2013, Thailand-registered Puthep Co. Ltd., which was a joint venture of Padaeng Industry Public Co. Ltd. of Thailand (51%) and PanAust Ltd. of Australia through its wholly owned subsidiary PNA Pty Ltd. (49%), recognized an impairment provision of the total investment in the Puthep copper project. In 2011, PanAust and Padaeng started the sale of its property, but the decision to execute the impairment provision came as the companies had no plans to develop the asset and no purchaser emerged from the sale process. The Puthep copper project was located at Loei in northern Thailand (PanAust Ltd., 2014).

Gold and Silver.—Kingsgate Consolidated Ltd. of Australia owned and operated the Chatree gold mine in central Thailand. In fiscal year 2014 (July 1, 2013, to June 30, 2014), the company produced 4,185 kilograms (kg) of gold and 30,863 kg of silver. The company mined about 6.2 million metric tons (Mt) of ore during the year with an average grade of 0.83 gram per metric ton (g/t) gold and 11.81 g/t silver. The company's mining activities at the Chatree property focused on the higher grade ore of Pit A and the near-surface oxide zones around the property. Exploration activities within the Chatree property remained a priority during 2014, from which the company identified shallow mineralization located adjacent to Pit A as well as within the Q Prospect area. The company planned to continue exploration drilling activities in 2015 with the goals of increasing resources and reserves and expanding the exploration area to include testing adjacent areas, such as K East, K West, and the southern part of Pit A. As of June 2014, proved and probable reserves at the Chatree property were estimated to be 54.4 Mt at grades of 0.80 g/t gold and 9.25 g/t silver (Kingsgate Consolidated Ltd., 2014, p. 2, 6, 12–13, 16, 32).

Iron and Steel.—In August 2014, TY Steel Co. (a subsidiary of Tycoons Group International Co. Ltd.) announced the start of its plant operations in Thailand. The TY Steel plant, which manufactured wire rod and rebar, supplied products to the infrastructure sector of the country. The production capacity of its facility was estimated at 15,000 metric tons per month of rebar products (Lin, 2014).

Zinc.—Padaeng was engaged in the mining, milling, and smelting of zinc and the production of zinc alloys in Thailand. Padaeng owned the only zinc mine in Thailand (the Mae Sod Mine), which is located in the Mae Sod District of Tak Province. Padaeng's smelter was located in the Muang District of Tak Province, and the roaster plant was located in Rayong Province. In 2014, Padaeng offered training programs to employees and communities that are located near the Mae Sod Mine in order to prepare for the mine's closure owing to resource depletion. The mine's closure was expected in late 2016 or early 2017, although implementation of closure would extend from 2015 through 2021. After the termination of mine operations, the company was expected to continue to rehabilitate the area during the next 5 years. By yearend 2014, the company had completed about 60% of the rehabilitation plan for the mine site. Also, Padaeng canceled a mining application lease that it had submitted to the Government for the Mae Sod Mine area after the Government reclassified the area as a protected watershed zone. Given the new classification, mining activities in the reclassified zone were prohibited (Padaeng Industry Public Co. Ltd., 2015).

Industrial Minerals

Cement.—In 2014, a total of seven cement companies operated 12 plants in Thailand with a total (combined) production capacity of 56.3 million metric tons per year (Mt/yr) and total production for the year of about 35 Mt of cement. The Siam Cement Group (SCG) announced during the first quarter of 2014 that it planned to cut back cement shipments from Thailand. SCG proposed cement shipments of 3 Mt in 2014 compared with 4 Mt in 2013 and 5 Mt in 2012. SCG's operational plans were affected by political instability (Global Cement, 2014; Thailand Cement Manufacturers Association, 2014).

In mid-2013, TPI Polene Public Co. Ltd. announced the construction of a new line in its Saraburi Province cement plant at a cost of $300 million. The company projected the new line to commence production in 2015 with a production capacity of 10,000 metric tons per day of clinker. After the completion of the project, the plant would have a total capacity of 12 Mt/yr (International Cement Review, 2013).

Mineral Fuels

Natural Gas and Petroleum.—In July 2014, the Thai Government announced a cut in natural gas imports after reports that the consumption growth in the country had dropped to a two-decade low level. Demand for gas decreased significantly as did consumption of power and petrochemicals; the situation came about at the same time that the economy was being affected by political unrest. PTT Exploration and Production Public Co. Ltd. (PTT PCL), which was Thailand's only gas supplier and the country's biggest energy conglomerate, reduced gas imports from neighboring Burma. On average, about 80% to 85% of the country's demand for gas was met by domestic production, 12% to 16% was met by imports from Burma, and the remaining 3% to 4% was met by liquefied natural gas (LNG) imported into the country. Prior to the political turmoil, the increase in demand for natural gas averaged 7% to 8% annually. In 2015, the Government expected LNG imports to increase by about 500,000 metric tons per year (t/yr) owing to a supply contract agreement with the Government of Qatar (Jittapong and Tan, 2014).

In 2014, PTT PCL announced plans to expand capacity at the Map Ta Phut LNG import terminal to 10 Mt/yr by building a 5-Mt/yr regasification facility at a cost of $3.8 billion. The proposed project was expected to be completed by 2017 and would include two 64,800-t storage tanks to be located at the terminal in Rayong Province. PTT PCL was also considering building a second LNG import terminal with an estimated capacity of 5 to 10 Mt/yr of LNG to meet domestic demand from the power-generation industry. The project was proposed to commence operations by 2020 and would be located near the Map Ta Phut terminal in the Gulf of Thailand (Petroleum Economist, 2014).

In November 2014, Tap Oil Ltd. announced the start of production at the Manora oilfield, which is located offshore Thailand and was operated by Mubadala Petroleum. The project was developed at a cost of $300 million, and had a production capacity of 15,000 barrels per day of oil. The company was expected to reach full capacity by the first quarter of 2015. Manora oilfield was owned by Mubadala (60%), Tap Oil (30%), and North Gulf Petroleum (10%) (Wilkinson, 2014).

Outlook

Thailand experienced challenging years in 2013 and 2014, mainly owing to political instability, which affected the overall growth of the economy and investment and trade. Economic recovery will depend on the political stability of the country and private sector confidence to reestablish business and investment ties in Thailand. In addition, the establishment of a permanent Government will most likely determine the pace of the country's economic recovery.

According to the Bank of Thailand, the country's economy is expected to perform better in 2015 than in 2014. As an export-oriented emerging economy, Thailand's manufacturing and service sectors are expected to improve their performance during the next few years (Bank of Thailand, 2015c).

Demand for cement in 2015 would depend on the Government's infrastructure spending, which had decreased by 2014 as a result of the political unrest (International Cement Review, 2014). On the other hand, by 2015, the Government expected LNG imports to increase by about 500,000 t/yr owing to the start of a supply contract with the Government of Qatar. Kingsgate planned to further explore for gold at the Chatree Mine leasing area in order to extend the mine's life.

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TABLE 1
THAILAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
METALS						
Antimony:						
Ore, gross weight		--	25	28	-- [r]	--
Metal, smelter		500 [e]	500 [e]	672	488 [3]	706
Copper, metal, refined, secondary		723 [r]	525 [3]	721 [r]	203	229
Gold, mine output, Au content	kilograms	4,046 [r]	2,860 [3]	4,895 [r]	4,419 [r]	4,576
Iron and steel:						
Iron ore:						
Gross weight		979,937	489,359	303,233	389,620	347,918
Fe content		480,000 [r]	240,000	149,000	191,000	170,500
Crude steel	thousand metric tons	4,145	4,238 [r]	3,328 [r]	3,578 [r]	3,500 [e]
Lead, metal, secondary		55,500	93,000 [r, e]	86,507	87,385	79,250
Manganese ore:						
Metallurgical grade, gross weight, 46% to 50% MnO_2		50,450	398	8,151	14,320	14,330
Mn content		24,200 [e]	187	3,830 [r]	6,730 [r]	6,900
Silver, mine output, Ag content	kilograms	17,558	19,456	32,047 [r]	32,381 [r]	31,046
Tin:						
Concentrate, Sn content		292	286	199	132	156
Metal, primary		20,000	20,000	19,996	19,088	16,929
Tungsten:						
Gross weight		711 [r]	292	133	252	173
Concentrate, W content		300 [r]	160 [r]	80	140 [r]	100
Zinc:						
Ore:						
Gross weight		146,470	148,391	166,642 [r]	172,578	226,893
Zn content		25,529	29,664 [r]	31,000 [r]	30,000 [r]	39,140
Metal, primary		103,620 [r]	103,366 [r]	97,000 [r]	76,576 [r]	65,694
Alloy, Zn content		30,000 [e]	35,163	30,400 [e]	23,000 [e]	20,000
INDUSTRIAL MINERALS						
Barite		33,465	67,703	64,499	107,437	134,961
Cement, hydraulic	thousand metric tons	28,840 [r]	30,290 [r]	31,760 [r]	35,854 [r]	34,980
Clays:						
Ball clay		1,513,767	425,048	447,348 [r]	112,187 [r]	123,082
Bentonite		130	55,220	141,000 [r]	150	--
Kaolin, marketable:						
Beneficiated, washed		156,827	163,881	141,764 [r]	119,512 [r]	124,094
Nonbeneficiated, unwashed		582,994	932,326	1,000,975 [r]	631,133 [r]	755,913
Filler		3,837	4,329	300	-- [r]	--
Diatomite		7,100	38,130	8,500	-- [3]	--
Feldspar		641,900	1,041,152	1,100,723 [r]	1,072,656	1,413,428
Fluorspar, crude, metallurgical grade		2,222	5,093	9,602	NA	NA
Gypsum	thousand metric tons	10,173	10,994	11,447	12,383	12,445
Perlite		14,700	26,500	41,400	14,293	54,100
Phosphate rock, crude		35,783	3,300	1,990	350	500
Rare earths:						
Monazite		NA	4,500	3,500	1,400	2,000
Rare earth oxide		NA	2,500	1,900	800	1,100
Salt, rock		1,405,406	1,359,493	1,363,539	1,300,156	1,381,067
Sand, silica, glass		323,985	221,721	434,094	876,085 [r]	1,083,174
Stone:						
Calcite		693,754	786,250	865,800 [r]	841,746 [r]	991,981
Dolomite		2,451,990	2,556,765	2,608,997 [r]	2,487,135 [r]	2,471,486
Granite:						
Dimension stone	cubic meters	6,123	5,267	5,505 [r]	2,950 [r]	2,976
Industrial rock	thousand metric tons	5,259	5,648	6,347 [r]	7,068 [r]	7,591
Limestone	do.	134,988	145,573	150,120 [r]	161,440 [r]	165,513
Marble, dimension stone and fragment	cubic meters	779,234	509,237	311,839	492,369 [r]	650,382
Marl for cement manufacture only		68,000	65,000	100,000	75,500 [r]	1,200

See footnotes at end of table.

TABLE 1—Continued

THAILAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
INDUSTRIAL MINERALS—Continued						
Stone—Continued:						
Quartz		49,064	152,576	404,800 [r]	393,791 [r]	194,831
Shale for cement manufacture only	thousand metric tons	4,181	4,593	4,755 [r]	4,307 [r]	5,409
Travertine		1,760	900	900	-- [r]	5,103
Talc		672	2,304	5,856	7,880	8,208
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite	thousand metric tons	18,399 [r]	21,327 [r]	18,069	18,111	17,991
Natural gas, gross production	million cubic meters	29,583	29,059	21,766	41,797 [r]	42,118
Petroleum:						
Crude	thousand 42-gallon barrels	55,906	50,976	37,164	54,561 [r]	50,647
Natural gas condensate	do.	31,730	30,693	21,169	33,273 [r]	34,430
Refinery products[e]	do.	229,000	229,000	229,000	369,713 [r]	362,199

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. do. Ditto. NA Not available. -- Zero.

[1] Table includes data available through August 31, 2015.

[2] In addition to the commodities listed, Thailand produced gemstones, pyrophyllite, and silicon, but available information was inadequate to make reliable estimates of output.

[3] Reported figure.

Sources: Department of Mineral Resources, Mineral Statistics of Thailand; Department of Primary Industries and Mines; Ministry of Energy; and Energy Policy and Planning Office.

TABLE 2
THAILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Antimony	metric tons	Amco Thai Mining Co. (Hibino Metal Industry)	Antimony smelter, Ban Pin, Phrae Province	555
Barite		Asian Mineral Resources Co. Ltd.	Loei, Mae Hong Son, Nakhon Si Thammarat, and Satun Provinces	60
Do.		P&S Barite Mining Co. Ltd.	Loei and Nakhon Si Thammarat Province	60
Cement		Asia Cement Public Co. Ltd.	Phra Phutthabat District, Saraburi Province	4,992
Do.		CEMEX (Thailand) Co. Ltd.	Chalerm Phrakiat District, Saraburi Province	845
Do.		Jalaprathan Cement Public Co. Ltd. (Cement Francais S.A., 37%; Veatprapat Holding Co. Ltd., 19%; others, 44%)	Takli District, Nakhon Sawan Province	1,152
Do.		do.	Cha-Am District, Petchaburi Province	1,190
Do.		Siam City Cement Public Co. Ltd. (Holcim Ltd., 27.5%; Rattanarak family, 27%; other investors, 45.5%)	Kaeng Koei District, Saraburi Province	14,784
Do.		TPI Polene Public Co. Ltd.	do.	9,074
Do.		Siam Cement (Ta Luang) Co. Ltd. (a subsidiary of SCG Cement-Building Materials Co. Ltd.)	Ta Luang Plant, Ban Mo District, Saraburi Province	3,072
Do.		do.	Khao Wong Plant, Praputtabath District, Saraburi Province	3,840
Do.		Siam Cement (Kaeng Khoi) Co. Ltd. (a subsidiary of SCG Cement-Building Materials Co. Ltd.)	Kaeng Khoi District, Saraburi Province	7,296
Do.		Siam Cement (Thung Song) Co. Ltd. (a subsidiary of SCG Cement-Building Materials Co. Ltd.)	Thung Song District, Nakorn Sri Thammarat	6,912
Do.		Siam Cement (Lampang) Co. Ltd. (a subsidiary of SCG Cement-Building Materials Co. Ltd.)	Chaehom District, Lampang Province	2,112
Do.		Thai Pride Cement Co. Ltd.	Kaeng Khoi District, Saraburi Province	960
Coal, lignite		Electricity Generating Authority of Thailand (EGAT) (Government, 100%)	Mae Moh, Lampang Province	20,000
Do.		Lanna Resources Punlic Co. Ltd.	Ban Pakha, Lamphun Province	1,000
Copper		Thai Copper Industries Public Co. Ltd. (TCI)	Rayong Industrial Park, Rayong Province	165
Feldspar, concentrate		Asia Mineral Processing Co. Ltd.	Provinces of Nakhon Si Thammarat	500
Fluorspar, concentrate		Asian Mineral Resources Co. Ltd.	Mae Hong Son Province	14
Gas, natural	million cubic meters per day	Esso Exploration and Production Khorat Inc.	Namphong, Khon Kaen Province	4
Do.	do.	TOTAL Exploration and Production (Thailand)	Bongkot in the Gulf of Thailand	15
Do.	do.	Chevron Corp.	Baanpot, Erawan, Funan, Kaphong, Pladang, Satun, Pailin, Trat, all in the Gulf of Thailand	33
Do.	do.	do.	Platong II project	NA
Gold	kilograms	Akara Mining Ltd. (Kingsgate Consolidated Ltd., 100%)	Chatree, Phichit Province	5,000
Gypsum		Vanich Gypsum Co. Ltd.	Khlong Prab, Mai Riang. Thoong Yai Mai in Provinces of Nakhon Si Thammarat and Surat Thani	8,500
Do.		Siam Cement Group	NA	NA
Do.	thousand square meters	Thai Gypsum Products Public Co. Ltd.	NA	75,000
Do.		Lotus Mines Co. Ltd.	Nakornsawan	NA
Do.		General Mining and Trading Co. Ltd.	Talad, Muang	NA
Iron ore, gross weight		P.T.K. Mining Co. Ltd.	Phu Ang, Loei Province	720
Lead, in concentrate		Kanchanaburi Exploration and Mining Co. Ltd.	Song Toh, Nong Phai, and Bo Ngam in Kanchanaburi Province	55
Petroleum, crude, including condensate	thousand 42-gallon barrels per day	Chevron Corp.	Benjamas, Tantawan, offshore in the Gulf of Thailand	35
Do.	do.	PTT Exploration and Production Public Co. Ltd. (PTTEP)	Arthit, Songkhla, Gulf of Thailand	20
Do.	do.	Mubadala Petroleum (60%), Tap Oil Ltd. (30%), North Gulf Petroleum (10%)	Manora oilfield, offshore in the Gulf of Thailand	15
Do.	do.	Thai Shell Exploration and Production Co. Ltd.	Sirikit in Kamphaenghet Province	24
Do.	do.	TOTAL Exploration and Production (Thailand)	Bongkot, offshore in the Gulf of Thailand	12
Do.	do.	Chevron Corp.	Baanpot, Erawan, Funan, Gomin, Jakrawan, Kaphong, Pailin, Platon, Satun, Surat, Trat Plamuk, offshore in the Gulf of Thailand	38

See footnotes at end of table.

TABLE 2—Continued
THAILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Silicon, metal (gross weight)	metric tons	G.S. Energy Co., Ltd.	Ratchaburi Silicon Plant	25,000
Silver	kilograms	Akara Mining Ltd. (Kingsgate Consolidated Ltd., 100%)	Chatree, Phichit Province	31,000
Steel, rolled		The Bangkok Iron and Steel Works Co. Ltd.	Phrapradaeng, Samutprakarn Province	120
Do.		Bangkok Steel Industry Public Co. Ltd.	do.	300
Do.		Tata Steel (Thailand) Plc (Tata Steel Ltd., 67.9%; McDonald Investment, 6.5%; other investors, 25.6%)	Map Ta Phut, Rayong Province; Sriracha, Chonburi Province; Ban Mon, Saraburi Province	1,700
Do.		Namheng Steel Co. Ltd.	Lopburi Province	300
Do.		Sahaviriya Group Corp. Ltd.	Bang Saphan, Prachuap Khiri Khan Province	2,400
Do.		Siam United Steel Co. Ltd.	Rayong Province	1,000
Do.		G-Steel Plc (formerly Siam Ystrip Mill Plc)	Bann Khai, Rayong Province	600
Steel, rebar		TY Steel Co. (a subsidiary of Tycoons Group International Co. Ltd.)	Wire rod and rebar plant located in Rayong Province	180
Tantalum, metal powder and oxides	metric tons	H.C. Starck (Thailand) Co. Ltd. (H.C. Starck GmbH, 94.98%, and others, 5.02%)	do.	250
Tin:				
Concentrate		Numerous small companies	Nakhon Si Thammarat, Phangnga, Phuket, and Rayong Provinces	3
Refined		Thailand Smelting & Refining Co. Ltd. (Thaisarco) (Amalgamated Metal Corp. Group, 77.1%, and other, 22.9%)	Phuket, Phuket Province	30
Tungsten, in concentrate	metric tons	SC Mining Co. Ltd. (Som Chai family, 100%)	Ban Pin, Phrae Province	650
Zinc:				
In concentrate		Padaeng Industry Public Co. Ltd. (Bali Ventures Ltd., 21.7%; Thai Ministry of Finance, 13.81%; RAK Minerals & Metals Investments, 12.5%; and others, 52%)	Mae Sod District, Tak Province	65
Refined		do.	Smelter in Muang District, Tak Province; Roaster plant in Rayong Province	115

Do., do. Ditto. NA Not available.

THE MINERAL INDUSTRY OF VIETNAM

By Yolanda Fong-Sam

In 2014, Vietnam ranked seventh in the production of crude petroleum in the Asia and the Pacific region. Vietnam also produced about 1.9% and 1.4% of the world's tin and cement, respectively (Anderson, 2016; U.S. Energy Information Administration, 2015; van Oss, 2016). Other commodities produced in the country included antimony, bauxite, chromium ore, coal, lead, manganese, natural gas, nickel, phosphate rock, salt, tungsten, and zirconium. As for major processed minerals, Vietnam produced refined copper, rolled steel, refined tin, and zinc. A complete list of mineral commodities produced can be found in table 1.

Minerals in the National Economy

According to the General Statistics Office of Vietnam, the output value of the mining and quarrying sector (which included mineral fuels and nonfuel minerals) in 2013 (the latest year for which data were available) decreased by about 1.1% to an estimated $11,036 million[1] (in 2010 constant dollars) from $11,157 million in 2012. In 2013, the mining and quarrying sector made up about 9.1% of the country's total estimated gross domestic product of $121.8 billion (in 2010 constant dollars) (General Statistics Office of Vietnam, 2013b).

Government Policies and Programs

During 2013 and 2014, the Government of Vietnam continued with the creation and approval of a series of legal instruments in support of the 2010 Mineral Law, in part to attract international investor interest in the country's potential for mineral mining. On January 27, 2014, and effective immediately, the Prime Minister of Vietnam issued Decision 203/QD–TTg, "Approving Areas Not Subject to Auction of Mineral Mining Rights Within the Licensing Authority of the Ministry of Natural Resources and Environment (MONRE)" (Decision 203). Under the 2010 Mineral Law, a mining license for a specific area was granted through auction unless provided otherwise by the Prime Minister. Under Decision 203, the Prime Minister exempted certain mineral areas from auction; instead, the MONRE has the authority to grant the mining licenses to appropriate applicants. Some of the exempted areas include clay and limestone, cement facilities that are planned to be developed by the Government, coal areas that are included in the country's coal development plan approved by the Prime Minister, and areas that contain uranium (Allens Pte Ltd., 2014).

In February, the Government of Vietnam signed a decision to issue Dispatch No. 18228/BTC–CST, which directs the Department of Taxation to carry out Resolution No. 712/2013/UBTVQH13, which establishes a new export tax rate for natural resources. Effective on February 1, 2014, the resolution increased the export tax rate for metal minerals as follows—for copper (to 13% from 10%), iron (to 12% from 10%), titanium (to 16% from 11%), and tungsten and antimony (to 18% from 10%). Export tax rates were also increased for nonmetallic minerals, such as apatite (to 5% from 3%), brown coal and coke coal (to 9% from 7%), sand (to 11% from 10%), and stone and gravel (to 7% from 6%) (Vietnam National Coal and Mineral Industries Holding Co. Ltd., 2014c).

On March 30, the Government issued Directive No. 03/CT–TTg to improve the performance of state management of minerals by strengthening the implementation of policies and the law on minerals. Directive No. 03 requires companies and individuals that plan to invest in or establish a mineral-processing plant in Vietnam to geologically survey the area, to complete mineral exploration to determine material sourcing, and to establish mineral import contracts. The mining license holder is required to use approved techniques to process minerals, to comply with the plant's production capacity, and to satisfy environmental protection requirements. Under Directive No. 03, no new gold exploration and mining licenses are to be granted; small-scale mineral exploration licenses are limited (with the purpose of eventually stopping the granting of these licenses), and the export of unprocessed minerals is prohibited. Directive No. 03 also designates various Government agencies to oversee different aspects of the mining industry; for example, the Department of Geology and Minerals of Vietnam is to coordinate with tax agencies to thoroughly monitor the quantity of minerals mined by license holders; the Ministry of Finance is to oversee the General Department of Customs, which is tasked to inspect exports and apply measures to prevent mineral export fraud; and the Ministry of Defense is to direct Vietnam's Border Guards, Marine Police, and other agencies to monitor and thwart illegal mineral trade across the country's borders (Vietnam Law & Legal Forum, 2015).

On May 29, the MONRE issued Circular No. 16/2014/TT–BTNMT, which monitors the operations of the mineral mining rights auction council. The council was created to assist MONRE and the People's Committee in Provinces and cities to organize and conduct the auctions of mineral mining rights as stipulated in the Mineral Law. Other tasks performed by the council involve establishing regulations for the auctions, such as the auction rules for mineral rights acquisition as well as for auction prices, auction procedures, confirmation of auction results, handling of auction inconsistencies, and general oversight of the auctions. Circular No. 16 went into effect on June 22 (Vietnam Breaking News, 2014).

Joint-Circular 54/2014/TTLT–BTNMT–BTC dated September 9, 2014, went into effect on October 27. Under Joint-Circular 54, the commission fee for mining bidding rights is increased to $600 from $100. In addition, the winning bidder must pay $2.5 million up front to obtain the mining license, and if the bidding price for the license is higher than $2.5 million, the license holder has up to 5 years to pay the balance (Buzenet and Nguyen, 2014).

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[1] Where necessary, values have been converted from Vietnam dong (VND) to U.S. dollars (US$) at average annual rates of VND20,995=US$1.00 for 2014, VND20,878=US$1.00 for 2013, and VND20,693=US$1.00 for 2012.

Production

In 2014, mineral production increased significantly for cobalt (by about 792%), nickel (683%), and copper concentrate (34%). These increases were mainly owing to the commencement of Asian Mineral Resources Ltd. (AMR) of Canada's Ban Phuc nickel mine in mid-2013. Other production increases were reported for ferrotungsten (56.6%), tungsten (50.6%), zirconium (11.8%), and antimony (8.4%). Production decreased for manganese (92%), bauxite (by 40%), titanium (9.4%), and iron ore, metal content (7.5%). Data on mineral production are in table 1.

Structure of the Mineral Industry

According to the General Statistics Office of Vietnam, the number of employees working in the mining and quarrying sector in 2013 (the latest year for which data were available), was approximately 266,900, which accounted for less than 1% of the total number of employed people in the country. Investments in the mining and quarrying sector for 2013 (the latest year for which data were available) accounted for approximately $2.8 billion (in 2010 constant prices), which represented about 6.7% of the total investments in the country (General Statistics Office of Vietnam, 2013a, c). Table 2 is a list of major mineral industry facilities, the majority of which are dominated by Government-owned enterprises.

Mineral Trade

In 2014, total trade in Vietnam increased by approximately 13% to $298.2 billion from $264.0 billion in 2013. The total value of exports for 2014 was about $150.2 billion compared with $132.0 billion in 2013 (an increase of about 13.8%). Exports of crude oil increased by 10.5% to 68.3 million barrels (Mbbl) in 2014 from 61.8 Mbbl in 2013. Additionally, exports of coal decreased by about 43% to approximately 7.3 million metric tons (Mt) in 2014 from about 12.8 Mt in 2013. In 2014, the total value of imports increased by about 12% to $148.0 billion from $132.0 billion in 2013. In 2014, imports of iron and steel increased by 25.5% to about 11.8 Mt from 9.4 Mt in 2013; and imports of refined petroleum products increased by 17% to 63.4 Mbbl from 54.2 Mbbl in 2013. Imports of fertilizers decreased about 19% to 3.8 Mt in 2014 from 4.7 Mt in 2013 (General Statistics Office of Vietnam, 2013 d–h; 2014b, d).

Vietnam's main trading partners in 2014 were the Association of South East Asian Nations (ASEAN), Australia, China, the European Union (EU), Japan, the Republic of Korea, and the United States. The United States was Vietnam's leading export partner, importing about $28.7 billion in Vietnamese goods (which was equivalent to 19% of Vietnam's total exports); it was followed by the EU, which imported $27.9 billion (18.6% of Vietnam's total exports), and the ASEAN, which imported $19.1 billion (12.7% of Vietnam's total exports). Vietnam's imports came mainly from China (which accounted about 30% of Vietnam's total imports and were valued at an estimated $43.9 billion), the ASEAN (15.5% of total imports valued at about $23 billion), and the Republic of Korea (14.7% of total imports valued at about $21.7 billion) (General Statistics Office of Vietnam, 2014a–d).

Commodity Review

Metals

Bauxite and Alumina and Aluminum.—In October 2013, Vietnam National Coal and Mineral Industries Holding Corp. Ltd. (VINACOMIN) announced the commissioning of the Tan Rai alumina plant, which is located in the Bao Lam District in Lam Dong Province in the country's Central Highlands. In April 2014, VINACOMIN projected that the Tan Rai plant would reach its full design capacity of 650,000 metric tons per year (t/yr) of alumina by 2015. During 2014, the plant was estimated to be producing at 85% to 90% of capacity. In Dak Nong Province, VINACOMIN was also building the Nhan Co bauxite mining and refinery complex. By late 2014, the company estimated the project to be 2 years behind schedule owing mainly to difficulties in acquiring the land. The plant, which had an estimated building cost of $776 million, was expected to start trial production by late 2015. According to VINACOMIN, the Nhan Co complex would include a bauxite mine and an alumina refinery. The mine was expected to have a capacity of 1.65 million metric tons per year (Mt/yr) of bauxite and the plant would have the capacity to produce 650,000 t/yr of alumina (Vietnam National Coal and Mineral Industries Holding Co. Ltd., 2014b, 2015).

According to Vietnam's National Assembly Standing Committee, the Tan Rai plant was projected to incur losses of about $12.4 million during its first year of operation and an accumulative loss of $22 million by 2015, but would start to be profitable beginning in 2016. The Nhan Co. project was projected to incur losses amounting to $144 million during the first 6 years of operation, starting in 2015. VINACOMIN announced in June 2014, that the company had secured long-term alumina sales contracts with Marubeni Corp. of Japan, and Yunnan Aluminum Co. of China (Vietnam National Coal and Mineral Industries Holding Co. Ltd., 2014a).

Gold.—In February 2014, the State Bank of Vietnam granted Besra Gold Inc. of Canada a license renewal to export gold from its operations in the central Province of Quang Nam (Besra Gold Inc., 2014b).

In October, Besra resumed operations at its Bong Mieu Gold Mining Co. (BMGMC) in central Vietnam after operations were halted in November 2013 because of substantial damage caused by several typhoons to the mine's infrastructure and area surrounding the facility. Operations resumed briefly in June 2014, only to be suspended again in July owing to Besra's dispute over two tax claim cases involving two of Besra's operating companies—BMGMC and Phuoc Son Gold Co. (PSGC). The Government claimed that gold exported by both operating companies during 2011 and 2012 did not comply with the country's gold exportation requirements, and that, because several shipments did not meet the 99.99% gold purity, the exports were subject to a 10% tax. Based on Vietnam's gold exportation regulation, no export duties are charged if the goods comply with the requirements. Besra disputed the charges, asserting that the gold in the shipments was refined in country to a 99.99% purity. As of October 2014 operations at the PSGC property remained on hold pending resolution of the tax dispute (Besra Gold Inc., 2013a, b; 2014a, b).

Iron and Steel.—In September 2014, the Vietnam Steel Association (VSA) announced that local steelmakers were suspending production owing mainly to increased imports of steel products from China and other countries. Local steelmakers were finding it difficult to compete with the imported products. Effective in October, the Ministry of Industry and Trade (MoIT) of Vietnam imposed a new tariff on stainless steel products imported from China, Indonesia, Malaysia, and Taiwan. The new tariffs were implemented mainly to protect local producers. The new tariffs ranged from 3.07% to 37.29% compared with the 0% to 10% import tax before the new tariffs went into effect (Huang, 2014; Lee, 2014).

In November 2013, operations commenced at China Steel Sumikin Vietnam Joint Stock Co.'s (CSVC's) sheet-steel mill, which manufactured alloys, steel coils, steel sheets, and other flat-rolled products. The steel mill, which is located in Ba Ria-Vung Tau Province, was built at a cost of $1,150 million and had a production capacity of 1.2 Mt/yr of steel products. As of late 2014, the shareholder distribution of CSVC was as follows: China Steel Corp. (CSC) of Taiwan, 56% interest; Nippon Steel & Sumitomo Metal Corp. (NSSMC) of Japan, 30%; Formosa Ha Tinh Steel Corp. of Taiwan, 5%; Nippon Steel & Sumikin Bussan Corp. of Japan, 5%; Chun Yuan Steel Industry Co., Ltd. of Taiwan, 2%; and Hsin Kuang Steel Co., Ltd. of Taiwan, 2% (China Steel Sumikin Vietnam Joint Stock Co., 2014, 2015).

Nickel.—During 2014, the Ban Phuc Nickel project, which was a subsidiary of AMR (90% interest), produced 6,400 t/yr nickel in concentrate and 3,200 t/yr copper in concentrate. The project, which is located approximately 160 kilometers from Hanoi in Son La Province, started production in June 2013, and consisted of a mine and a processing facility. In 2014, the company received approval from the Government to construct a nickel smelter in Vietnam. The smelter would enable AMR to enhance the economic potential of the Ban Phuc project by reducing transportation costs, and significantly reducing export tariffs—to 5% (incurred for nickel matte) from 20% (incurred for nickel concentrate). For 2015, the company forecasted an increase in the annual production of nickel to 8,300 t/yr; of copper, to 4,100 t/yr; and of cobalt, to 200 t/yr (Asian Mineral Resources Ltd., 2014, p. 2, 8).

Industrial Minerals

Cement.—In March, the Government approved a proposal from the Ministry of Construction to expand the production capacity at the Xuan Thanh cement plant located in Ha Nam Province. The capacity at the plant would be increased to 4.5 Mt/yr from 2.3 Mt/yr, although no timeframe was provided regarding commencement of construction. Also in March, the Thach My cement plant commenced operations. The plant, which is located in Quang Nam Province, was built at a cost of $190 million and had the capacity to produce 1.7 Mt/yr of cement (GlobalCement.com, 2014a, c).

In June, PT Semen Indonesia (Persero) Tbk announced its plans to invest an estimated $300 million to build a second cement plant in Vietnam during the next 5 years. Thang Long Cement JSC, which was a subsidiary of Persero (70%), planned to start construction in early 2015 and to commence production in 2018. The plant would have a designed capacity of 1.5 Mt/yr of cement. Thang Long Cement's other cement plant in the country had a production capacity of 2.5 Mt/yr of cement (GlobalCement.com, 2014b).

In September, the Government canceled five cement plant projects owing mainly to low domestic cement consumption. The canceled cement projects had a combined capacity of 910,000 t/yr. In 2013, the Government had postponed or canceled the construction of nine other cement plants but had approved the construction of the Long Son Cement plant in Thanh Hoa Province. Production of the 2.3-Mt/yr-capacity Long Son plant was started in early 2014, and the plant was expected to begin operations in 2018 (GlobalCement.com, 2014d).

Rare Earths.—In April 2014, Shin-Etsu Chemical Co., Ltd. of Japan announced that it would invest $100 million in Vietnam to build a rare-earth-magnet plant to be located in Hai Phong Province. The plant started construction in October; the company planned for the plant to be built in two phases for a total capacity of 2,000 t/yr. Construction of the first phase began in September and was scheduled to be completed by September 2015 with a production capacity of 1,000 t/yr. The second phase was expected to be completed by September 2016 (Shin-Etsu Chemical Co. Ltd., 2015).

In December, Vietnam Rare Elements Chemical JSC (VRECJ) started plant construction on a 4-hectare property located in the southern Province of Ba Ria-Vung Tau. The plant, which was wholly owned by a Japanese firm, would process zircon ore and zirconium compounds. According to VRECJ, the plant was expected to have a production capacity of 13,300 t/yr of zirconium and 8,500 t/yr of sodium metasilicate in its first phase of operations (Vietnam Investment Review, 2014).

Mineral Fuels

Petroleum.—In July 2014, Santos Ltd. of Australia, announced the recommencement of oil production at the Dua oil project, which is located offshore in Nam Con Son Basin. The Dua oil project consists of three subsea wells in Block 12W. The company estimated the average production of the project to be 8,000 barrels per day of oil for the first 12 months. PetroVietnam held the majority interest in the Dua project (68.125%) and Santos and Premier Oil, which was the operator, held the remaining 31.875% (Santos Ltd., 2014).

Outlook

During 2014, the Government of Vietnam continued with the creation and approval of a series of legal instruments in support of the 2010 Mineral Law, in part to attract international investor interest in the country's potential for mineral mining. In recent years, international investment in mining projects in Vietnam has increased for such mineral commodities as bauxite, cement, copper, gold, nickel, tungsten. Trade between neighboring countries, along with continued foreign direct investment, have benefited the economy of Vietnam and increased trade within the ASEAN member countries and the South East Asian region. Future economic growth for Vietnam will be highly dependent on continued economic stability, structural reforms and updates in the country's mining policy, and improvements in infrastructure to attract international investors. Increased production of metals and industrial minerals is expected in the near future, as projects that were under development in recent years began operating in 2014, and other projects will start coming online between 2015 and 2018.

The cement industry and the construction sector in Vietnam have boomed in the past few years as modernization of Vietnam's infrastructure has continued to be a priority for the country. The Government has encouraged industry to focus on increasing the efficiency of existing cement plants and has approved new cement plant development. According to the Vietnam Cement Association, by 2015, the combined capacity of the country's cement plants would reach 90 Mt/yr; however, the demand for cement is projected to be 75 Mt/yr (GlobalCement.com, 2014d).

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TABLE 1
VIETNAM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
METALS						
Alumina[e]		--	--	--	214	485
Antimony:						
Gross weight		608 [r]	714 [r]	1199 [r]	2476 [r]	2684
Sb content (40%)		243	286	480	990	1074
Bauxite[e]		80,000	100,000	100,000	250,000	150,000
Cobalt, Co content		--	--	--	25 [r]	223 [r]
Copper:						
Concentrate, gross weight		49,038	47,552	45,065	49,148 [r]	48,072
Concentrate, Cu content[e]		11,300	11,300	11,300	12,000	16,100
Iron and steel:						
Iron ore:						
Gross weight		3,720,943	4,474,151	2,870,000	4,708,200 [r]	4,355,100
Fe content (53%)		1,972,100	2,371,300	1,523,100	2,495,329 [r]	2,308,200
Pig iron	thousand metric tons	500	600	650	650	650
Metal:						
Steel, crude	do.	2,906	2,931	2,965 [r]	2,845 [r]	2,900 [e]
Steel, rolled	do.	8,415	8,085	8,405 [r]	8,851 [r]	9,000 [e]
Lead, mine output, Pb content[e]		6,500	6,400	6,300	6,000	6,000
Manganese:[e]						
Gross weight		82,700	64,600	15,800	9,700	800
Mn content (43%)		35,600	27,800	6,800	4,200	340
Nickel, Ni content		--	--	--	817	6,400
Rare earth oxide[e]		170	200	200	100	100
Tin:						
Mine output, Sn content[e]		5,400	5,400	5,400	5,400	5,400
Metal, smelter		3,042	3,900	4,000 [e]	4,000 [e]	4,000 [e]
Titanium mineral concentrate, gross weight[3]		912,000	840,600	1,143,800	1,025,779 [r]	929,400
Tungsten:						
Mine output, W content		1,150	1,635	1,050	1,660 [r]	2,500 [e]
Ferrotungsten, gross weight, shipped[4]		--	--	--	511	800 [e]
Zinc:[e]						
Mine output, Zn content		40,000 [r]	30,000 [r]	30,000 [r]	20,000 [r]	20,000
Slab		16,000	16,000	18,000	18,000	18,000
Zirconium, gross weight[e, 5]		6,900	14,000	15,600	7,600	8,500
INDUSTRIAL MINERALS						
Barite[e]		85,000	85,000	85,000	85,000	85,000
Cement, hydraulic	thousand metric tons	55,801	58,271	55,531	57,516 [r]	60,507
Lime	do.	1,454	800 [r, e]	800 [r, e]	800 [r, e]	800 [e]
Monazite, concentrate, REO content		309	361	369	178 [3]	200
Phosphate rock:						
Gross weight	thousand metric tons	2,325	2,395	2,365	2,636 [r]	2,700
P_2O_5 content[e]	do.	680	720	710	790 [r]	810
Salt	do.	975	862	1,178	719 [r]	766
Sand and gravel, and silica sand	do.	110,300	101,295	83,223 [r]	74,543 [r]	75,000
Stone, all kinds	do.	381,828	404,421	355,251 [r]	334,183 [r]	340,000

See footnotes at end of table.

TABLE 1—Continued

VIETNAM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2010	2011	2012	2013	2014
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite	thousand metric tons	44,835	46,611	42,383	41,064 r	41,697
Gas, natural, gross	million cubic meters	9,402	8,480	9,403	9,751 r	10,210
Petroleum:						
Crude	thousand 42-gallon barrels	110,397 r	111,654 r	123,080 r	122,830 r	123,000 e
Refinery products:e						
Liquefied petroleum gas	do.	2,600	2,600	2,900	3,000	3,000
Gasoline	do.	17,100	17,300	19,000	19,000	19,000
Other	do.	21,000	21,200	23,300	23,500	23,500
Total	do.	40,700	41,100	45,200	45,500	45,500

eEstimated; estimated data are rounded to no more than three significant digits. rRevised. do. Ditto. -- Zero.

[1] Table includes data available through July 22, 2015.

[2] In addition to the commodities listed, bentonite, refractory clay, chromium, construction aggregates, refined copper, gemstones, gold, granite, graphite, gypsum, kaolin clay, lignite, marble, nitrogen, pig iron, pyrite, pyrophyllite, silver, and sulfur were produced, but not reported. Available information was inadequate to make reliable estimates of output.

[3] Estimated figures based on Vietnam's estimated exports of titanium ores to China, Japan, and the Republic of Korea.

[4] Reported as metric tons of ferrotungsten shipped by Hazelwood Resources Ltd., which is one of two ferrotungsten plants operating in Vietnam.

[5] Estimated figures based on Vietnam's estimated exports of zirconium ore to China.

Sources: The Barytes Association, World Barytes Production, 2008–2010; Copper Bulletin of the International Copper Study Group, May 2015; International Chromium Development Association, Development Association, Statistical Bulletin, 2010–2011; International Tungsten Industry Association, 2014; South East Asia Iron and Steel Institute, Crude Steel Production, Annual Statistics, August 2014; United Nations Comtrade Database for years 2010 to 2014; Vietnam's General Statistics Office, Statistical Yearbook, 2009–2014; World Bureau of Metal Statistics Yearbook 2015; World Steel Association, Steel Statistical Yearbook, 2014.

TABLE 2
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Vietnam National Coal and Mineral Industries Group (VINACOMIN)	Tan Rai alumina complex Bao Lam District, Lam Dong Province	650.
Barite	NA	Ao Sen deposit Son Duong District, Tuyen Quang Province	80.
Bauxite	Vietnam National Coal and Mineral Industries Group (VINACOMIN)	Tan Rai plant, F74Bao Lam District, Lam Dong District	650.
Do.	do.	Nhan Co Mine, Dak Nong Province	NA.
Bismuth	Masan Group	Nui Phao Mine, Thai Nguyen Province	2.3.
Cement	An Giang Cement Co.	An Giang cement plant, An Giang Province	400.
Do.	Binh Phuoc Cement Co.	Binh Phuoc cement plant, Binh Phuoc Province	2,000.
Do.	Building Materials Corp. No. 1	Fico Tay Ninh cement plant, Tan Chau District, Tay Ninh Province	2,000.
Do.	Cement X18 Factory Co.	Cement X18 plant, Lang Son Province	100.
Do.	Chin Fon Cement Co.	Chin Fon cement plant, Ha Giang Province	2,200.
Do.	Chinfon Hai Phong Cement Corp. [Ching Fong Group of Taiwan, 70%; Hai Phong Municipal Government, 15.56%; Vietnam National Cement Corp. (VICEM), 14.44%]	Min Duc cement near Hai Phong City	1,400.
Do.	Cong Thanh Cement Joint Stock Co.	Cong Thanh cement plant, Thanh Hoa Province	1,000.
Do.	Cao Ngan Cement Co.	Cao Ngan cement plant, Thai Nguyen Province	600.
Do.	Dong Banh Cement Co.	Dong Banh cement plant, Lang Son Province	1,000.
Do.	Dong Son Cement Co.	Dong Son cement plant,Thai Nguyen Province	1,500.
Do.	Dong Thanh Cement Co.	Dong Thanh cement plant, Dong Nai Province	1,000.
Do.	Ha Long Cement Co.	Ha Long cement plant, Ho Chi Minh City	2,000.
Do.	Ha Tien Kien Giang Cement Co.	Ha Tien Kien Giang cement plant, Binh Duong Province	200.
Do.	Lafarge (Vietnam) Cement	Cement grinding station, Dong Nai Province	500.
Do.	La Hien Cement Co.	La Hien cement plant, Thain Nguyen Province	600.
Do.	Langbang Cement Co.	Langbang cement plant, Quang Ninh Province	1,500.
Do.	Luckvaxi Cement Co.	Luckvaxi cement plant, Thien Hue Province	1,200.
Do.	Luck's Group (Vietnam Holdings) Co. Ltd.	Kim Dinh cement plant and Ninh Thuan grinding plant, Thua Thien-Hue Province	2,800.
Do.	Lucky Group Ltd. and Phuc Son Cement Corp.	Phuc Son cement plant, Hai Duong Province	4,000.
Do.	Mai Son Cement Co.	Mai Son cement plant, Son La Province	1,200.
Do.	Midland Construction Corp. (COSEVCO)	Song Gianh cement plant, Quang Binh Province	1,400.

See footnotes at end of table.

TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement—Continued		Morning Star Cement Ltd. [Holcim Group, 65%, and Vietnam National Cement Corp. (VICEM), 35%]	Cat Lai grinding plant, Hiep Phuoc grinding plant, and Thi Vai grinding plant, Hon Chong, Kien Giang Province	5,200.
Do.		Nghi Son Cement Corp. [Taiheiyo Cement Corp., 45.5%; Mitsubishi Materials Corp. of Japan, 19.5%; Vietnam National Cement Corp. (VICEM), 35%]	Nghi Son cement plant, Thanh Hoa Province	4,300.
Do.		Quang Ninh Cement and Construction Joint Stock Co.	Quang Ninh cement plant, Ha Long, Quang Ninh Province	1,200.
Do.		Quan Trieu Cement Joint Stock Co. (Viet Bac Mining Industry Corp. and VINACOMIN)	Quan Trieu cement plant, Thai Nguyen Province	820.
Do.		ROLI-Quang Tri Cement Co.	ROLI-Quang cement plant, Quang Tri Province	600.
Do.		Song Thao Cement Co.	Song Thao cement plant, Phu Tho Province	1,000.
Do.		Thai Nguyen Cement Co.	Thai Nguyen cement plant, Thai Nguyen Province	1,400.
Do.		PT Semen Indonesia (Persero) Tbk, 70%	Thang Long cement plant, Quang Ninh Province	2,500.
Do.		Tuyen Quang Cement Group 1	Tuyen Quang cement plant, Tuyen Quang Province	600.
Do.		Vietnam Construction and Import-Export Joint Stock Corp. (VINACONEX)	Cam Pha cement grinding plant, Phu Tau Province	2,300.
Do.		do.	Luongson cement plant, Hoa Binh Province	1,200.
Do.		do.	Yen Bai cement plant, Yen Bai Province	200.
Do.		Vietnam National Cement Corp. (VICEM) (Government, 100%)	Bim Son cement, Thanh Hoa Province	3,800.
Do.		do.	But Son cement, Ha Nam Province	1,600.
Do.		do.	Hai Phong cement, Ha Giang	1,700.
Do.		do.	Ha Tien I, Ho Chi Minh City	1,500.
Do.		do.	Ha Tien II, Kien Giang Province	1,200.
Do.		do.	Hai Van cement, Da Nang City	600.
Do.		do.	Hoang Mai cement, Nghe An Province	1,400.
Do.		do.	Hoang Thach cement, Hai Duong Province	2,300.
Do.		do.	Tam Diep cement, Ninh Binh Province	1,400.
Do.		Vietnam Industrial Construction Corp. (VINAINCON)	Quang Son cement factory, Quang Son Commune, Dong Hy District, Thai Nguyen Province	1,500.
Chromite, gross weight		Thai Nguyen Nonferrous Metal Co. [wholly owned subsidiary of state-owned Vietnam National Minerals Corp. (VIMICO)]	Nui Nua, Thanh Hoa Province	10.
Coal, anthracite		Vietnam National Coal Corp. (VINACOAL) (Government, 100%)	Cam Pha, Cao Son, Coc Sau, Vang Danh, Dong Trieu, Ha Lam, Ha Tu, Hong Gai, Khe Cham, Mao Khe, Mong Duong, Deo Nai, Cua Ong, and Uong Bi, Quang Ninh Province	42,000.
Cobalt	metric tons	Asian Mineral Resources (90% owned through subsidiary Ban Phuc Nickel Mines LLC)	Ban Phuc nickel project, Son La Province	200.

See footnotes at end of table.

TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper:			
Concentrate, Cu content	Asian Mineral Resources (90% owned through subsidiary Ban Phuc Nickel Mines LLC)	Ban Phuc nickel project, Son La Province	3.
Do.	Lao Cai Copper Complex [wholly owned subsidiary of Vietnam National Minerals Corp. (VIMICO)]	Sin Quyen, Lao Cai Province	11.
Do.	Masan Group	Nui Phao Mine, Thai Nguyen Province	7.
Ore	Sin Quyen Copper Co. [operated by Vietnam National Coal and Mineral Industries Group (VINACOMIN)]	Sin Quyen Mine, Bat Xat District, Lao Cai Province	1,200.
Refined	Tang Loong Lao Cai Copper Smelting Enterprise [wholly owned subsidiary of Vietnam National Coal and Mineral Industries Group (VINACOMIN)]	Tang Loong Long Commune, Bao Tang District, Lao Cai Province	10.
Fertilizer:			
Nitrogen, ammonia	Vietnam National Chemical Corp. (VNCC) (Government, 100%), and Phy My Nitrogenous Fertilizer and Chemical Joint Stock Corp.	Ha Bac, Phu My, Ba Ria-Vung Tau Province	375.
Superphosphate	do.	Lam Thao, Phu Tho Province	800.
Fluorspar	Masan Group	Nui Phao Mine, Thai Nguyen Province	210.
Gas, natural million cubic meters per day	VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubeznheft), and the joint venture of PetroVietnam, BP p.l.c., Oil and Natural Gas Co., and ConocoPhillips Co.	Offshore Bach Ho oilfield, Rang Dong oilfield, and Lan Tay and Lan Do gasfields	20.
Do.	Vietnam Oil and Gas Group (PetroVietnam) and operated by Cuu Long Joint Operating Co.	Su Tu Trang offshore field (Block 15.1), Cuu Long Basin	NA.
Gold, gold content of mine output kilograms	Bong Mieu Gold Mining Company Ltd. (Besra Gold Inc., 80%; Mineral Development Co., 10%; Quang Nam Mineral Joint Stock Co., 10%)	Bong Mieu Mine and Nui Kem underground mines, Quang Nam Province	400.
Do.	Besra Gold Inc. (85%)	Bai Dat and Bai Go deposit within the Phuoc Son gold property, Quang Nam Province	NA.
Iron ore, gross weight	Thai Nguyen Iron and Steel Corp. [wholly owned subsidiary of Vietnam National Steel Corp. (VNSTEEL)]	Trai Cau and Tien Bo, Thai Nguyen Province; Thach Khe, Ha Tinh Province	850.
Nickel	Asian Mineral Resources (90% owned through subsidiary Ban Phuc Nickel Mines LLC	Ban Phuc nickel sulfide deposit, Son La Province	7.
Petroleum, crude thousand 42-gallon barrels per day	Santos Ltd. and Premier Oil, 31.875%, and Petro Vietnam, 68.125%	Dua Oil project (offshore), Nam Con Son Basin (Block 12W)	8,000.
Do.	VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubeznheft)	Offshore Bach Ho, Rong, Rang Dong, Ruby, Bunga Kekwa, Dai Hung, and SuTu Trang oilfields	320.
Refined thousand 42-gallon barrels	Vietnam Oil and Gas Group (PetroVietnam), 50%; ConocoPhillips Co., 23.25%; Korea National Oil Corp., 14.25%; SK Innovation, 9%; Geopetrol SA, 3.5%. Operated by Binh Son Refining and Petrochemical Co.	Dung Quat refinery, Quang Ngai Province	47,600.
Phosphate rock, gross weight	Vietnam Apatite Limited Co. [Vietnam National Chemical Corp. (VNCC), 100%]	Cam Duong and Tang Loong, Lao Cai Province	1,250.
Rare earths	Lai Chau-Vietnam National Minerals Corp. (VIMICO) Rare Earth Joint Stock Co. and the Japanese Dong Pao Rare Earth Development Co.	Dong Pao Rare Earth Mine, Tam Duong District, Lai Chau Province	NA.
Salt	Vietnam National Salt Corp.	Nam Dinh, Nghe An, and Hai Tin Provinces	1,200.
Steel:			
Crude	Vietnam National Steel Corp. (VNSTEEL)	Cai Lan, Thai Nguyen Province, and Phu My, Ba Ria-Vung Tau Province	1,500.

See footnotes at end of table.

TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Steel—Continued:			
Products	Shengli (Vietnam) Special Steel Co. Ltd., established by Shengli Group Corp., and Guangdong Metals and Minerals Import & Export Corp.	Cau Nghin Industry billets plant, Quynh Phu, Thai Binh Province	500.
Do.	do.	Bar & wire rod plant, Quynh Phu, Thai Binh Province	600.
Rolled	Lotus Group	Cold-rolled steel plant in Phu My Industrial Park, Ba Ria-Vung Tau Province	1,000.
Do.	POSCO-Vietnam (POSCO Group, 100%)	POSCO Special Steel in Phu My Industrial Park, Ba Ria-Vung Tau Province	700 cold-rolled steel.
Do.	do.	do.	3,000 hot-rolled steel.
Do.	Vietnam Shipbuilding Industry Group (VINASHIN)	Cai Lan steel plate hot-rolling plant, Ha Long City, Quang Ninh Province	1,000.
Do.	Viet Steel Corp.	Bar mill, Ba Ria-Vung Tau Province	450.
Do.	Vietnam National Steel Corp. (VNSTEEL)	Cai Lan, Thai Nguyen Province, and Phu My, Ba Ria-Vung Tau Province	2,500.
Sheet	China Steel Sumikin Vietnam Joint Stock Co. (China Steel Corp., 56%; Nippon Steel & Sumitomo Metal Corp., 30%; Formosa Ha Tinh Steel Corp., 5%; Nippon Steel & Sumikin Bussan Corp. of Japan, 5%; Chun Yuan Steel Industry Co., Ltd. of Taiwan, 2%; Hsin Kuang Steel Co., Ltd. of Taiwan, 2%	Sheet steel mill, Ba Ria-Vung Tau Province	1,200.
Tin:			
Concentrate, Sn content	Cao Bang Nonferrous Metal Co. and Nghe Tinh Nonferrous Metal Co. [wholly owned subsidiaries of state-owned Vietnam National Minerals Corp. (VIMICO)]	Pia Oac, Cao Bang Province; Quy Hop, Nghe An Province; and Tam Dao, Tuyen Quang Province	4.
Refined	Thai Nguyen Nonferrous Metal Co.	Thai Nguyen, Bac Thai Province	2.
Titanium, ilmenite	Bimal Minerals Co. Ltd. (Malaysia Mining Corp. and Syarikat Pendorong Sdn. Bhd., 60%, and Binh Dinh Minerals Co., 40%)	Cat Khanh, Qui Nhon, and Binh Dinh Provinces	70.
Do.	Ha Tinh Minerals and Trading Co.	Cam Hoa, Ky Anh-Cam, Xuyen, Ky Khan, and Ky Ninh, Ha Tinh Province	450.
Do.	Mineral Development Co. No. 4 and No. 5 [wholly owned subsidiaries of Vietnam National Minerals Corp. (VIMICO)]	Vinh City, Nghe An Province; Tuy Hoa, Dong Xuan, Phu Yen Province; and Quang Ngan, Vinh My, Thua Thien-Hu Province	50.
Tungsten:			
Concentrates	Nui Phao H.C. Starck Tungsten Chemicals Manufacturing LLC [Nui Phao Mining Co. Ltd (74.1%) (Masan Group) and H.C. Starck GmbH]	Nui Phao Mine, Dai Tu District, Thai Nguyen Province	7.
Do.	Sanher Tungsten Vietnam Co. Ltd.	Nhon Trach District, Dong Nai Province	NA.
Do.	Tejing (Vietnam) Tungsten Co., Ltd.	Trang Bang District, Tay Ninh Province	2.
Do.	Vietnam Youngsun Tungsten Industry Co.	Thienke tungsten mine, Tuyen Quang Province	2.
Ferrotungsten, W content	Vietnam Youngsun Tungsten Industry Co. Ltd. (Hong Kong Wolfram International Investment Co., Ltd.)	Cailan Industrial Zone, Quang Ninh plant, Halong, Quang Ninh Province	3.
Do.	ATC Ferrotungsten [operated by Asia Tungsten Products Vietnam Ltd. (Hazelwood Resources Ltd., 60%)]	Tan Tien Industrial Zone, Vinh Bao District, Hai Phong Province	4.

See footnotes at end of table.

TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Zinc:			
Concentrate, Zn content	Thai Nguyen Nonferrous Metal Co. [wholly owned subsidiary of state-owned Vietnam National Minerals Corp. (VIMICO)]	Cho Dien, Bac Can Province	50.
Refined	The Ta Pan Zinc-Lead Plant (a Chinese private firm, 70.2%, and Ha Giang Mineral Exploiting and Engineering Co., 29.8%)	Lung Vay, Bac Me District, Ha Giang Province	6.
Do.	Thai Nguyen Zinc Refinery [wholly owned subsidiary of state-owned Vietnam National Minerals Corp. (VIMICO)]	Thai Nguyen City, Thai Nguyen Province	10.

Do., do. Ditto. NA Not available.

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